

Government Policy on Waste Management in Panca Rijang District, Sidenreng Rappang Regency

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Abstract. This study aims to analyze public policy regarding waste management in Panca Rijang District, Sidenreng Rappang Regency; identify factors influencing its implementation; and formulate an effective and sustainable waste management policy model. The study employs a qualitative method with a descriptive approach. Data were collected through in-depth interviews, observation, and documentation. Research informants included the Panca Rijang District Head, the Sidenreng Rappang Regency Environmental Agency, sub-district heads, sanitation workers, and local residents. Data analysis utilized the Miles and Huberman interactive model, comprising data reduction, data display, and conclusion drawing, and was reinforced by analysis using NVivo 12 Plus software. The results indicate that the implementation of waste management policy in Panca Rijang District has not yet proceeded optimally. Key issues identified include low rates of household waste sorting, limited waste collection fleets, suboptimal utilization of 3R (Reduce, Reuse, Recycle) waste facilities, and low community participation. Policy effectiveness is influenced by policy and regulatory factors, implementation factors (facilities, infrastructure, human resources, and budget), and community behavior. Regarding the policy network, the government remains the dominant actor, while the involvement of the public, community groups, and the private sector remains suboptimal. This study recommends a Multi-Stakeholder Collaboration-Based Waste Management Policy Model, achieved through strengthened inter-actor coordination, improved facilities and infrastructure, optimized 3R facilities, and enhanced public education and participation to realize effective and sustainable waste management tailored to the local characteristics of Panca Rijang District.

Keywords: *Public Policy, Waste Handling, Policy Analysis, Policy Network, Waste Management.*

A. INTRODUCTION

Waste management remains a public policy issue of ongoing concern to both the government and the public due to its multidimensional impacts on the environment, health, socio-economic conditions, and governance. Population growth and urbanization have led to a significant increase in waste volume; consequently, waste is no longer merely an environmental issue but a socio-economic problem requiring a holistic approach. Challenges in implementing waste management policies remain complex, involving issues such as limited infrastructure and low implementation effectiveness at the local level (Salsabila et al., 2024).

At the national level, Indonesia possesses a legal framework for waste management, specifically Law Number 18 of 2008 concerning Waste Management and various regional regulations, that incorporates the "reduce-reuse-recycle" (3R) principles. However, these regulations have not fully resolved issues on the ground, particularly regarding synergy among the central government, local governments, and the community during implementation. Policy implementation across various regions often faces obstacles related to limited facilities and infrastructure, coordination issues, and insufficient human resource capacity (Yusuf, 2025). A study in Garut Regency identified barriers regarding management efficiency and stakeholder coordination (Fauzan, 2019); a study in Sidoarjo City confirmed that existing policy structures have not been fully effective in mitigating the negative impacts of waste (Salsabila et al., 2024); meanwhile, research in Pontianak highlighted local government commitment, private sector involvement, and cross-sector synergy as key factors for policy success (Rizqullah, 2023).

Community participation is also a crucial element; policies that fail to actively involve the community tend to lack sustainability (Lestari et al., 2020).

In Panca Rijang District, community participation in waste management remains relatively low, as waste management is still viewed solely as the government's responsibility. The private sector has also seen limited involvement, despite evidence that private-sector partnerships enhance the effectiveness of waste management systems in other regions (Lisa, 2024). Research on public policy regarding waste management at the sub-district level, which serves as the frontline of policy implementation in direct contact with the community, remains relatively limited compared to studies conducted at the city or regency scale (Aulia, 2025). The Panca Rijang Sub-district government provides waste collection services twice a week; however, limited fleet capacity and schedules that do not align with community waste generation patterns have led to waste accumulation at several locations, particularly in densely populated areas.

Fauzan (2019) found that waste management policy implementation in Garut Regency was suboptimal due to weak inter-agency communication, resource limitations, and low public compliance, yet the study did not examine a collaboration-based sustainable policy model at the sub-district level. Lestari et al. (2020) found that low public participation led to unsustainable waste management but did not link this to policy networks or the role of the private sector. Rifqi et al. (2023) demonstrated that successful waste management in Pontianak City was heavily influenced by synergy among the government, private sector, and community within a policy network, though the study focused on the city level. Salsabila et al. (2024) found waste management policy in Sidoarjo City ineffective, failing to meet indicators of effectiveness, efficiency, and responsiveness, but did not formulate a contextual alternative policy model. Lisa (2024) showed that regions involving the private sector possessed more innovative and efficient waste management systems, yet did not address policy dynamics at the sub-district level. The divergence between public policy analysis theories emphasizing implementation rationality and approaches focusing on policy and issue networks, which highlight actor relationships, combined with the scarcity of research holistically integrating these four perspectives (policy analysis, policy networks, issue networks, and agenda-setting) at the frontline level of government, constitutes both the research gap and the novelty of this study.

This study aims to analyze the current state and practices of waste management, identify the factors influencing them, and formulate an effective and sustainable waste management policy model.

B. LITERATURE REVIEW

1. Public Policy Analysis Theory

Public policy analysis is an applied social science discipline that utilizes various methods and techniques to generate policy-relevant information (Dunn, 2003). According to Dunn (cited in Fatmariyanti & Fauzi, 2023), the policy cycle consists of five stages: problem formulation, forecasting, policy recommendation, policy monitoring, and policy evaluation.

Dunn (2003), cited in Hardiyanti et al. (2020) proposes six criteria for policy evaluation: effectiveness, efficiency, adequacy, equity, responsiveness, and appropriateness. These six criteria serve as guidelines for collecting and analyzing information derived from interviews, observations, and documents in this study.

2. Policy Network Theory

Waste management is a complex public issue involving various actors with differing interests and roles; consequently, the policy network approach is employed to understand the

patterns of relationships and interactions among these actors (Nurika et al., 2024). Rhodes (2007) defines a policy network as a relatively stable relationship among interdependent actors within a specific policy sector; in the context of waste management, these actors include local governments, environmental agencies, village/sub-district administrations, business entities, NGOs, environmental communities, and the general public, each possessing distinct resources (Antin et al., 2018).

Heclo's (1978) concept of the "issue network" explains how a public issue, such as waste accumulation and environmental pollution, gains attention and enters the policy agenda through interactions among environmental activists, academics, the media, communities, and the government (Mulyani et al., 2026). Issue networks and policy networks are complementary: issue networks serve as a space for initial discussion, whereas policy networks provide a more structured framework for policy implementation (Mariane et al., 2025), enabling a clear division of roles among actors, from program formulation to oversight (Akbar et al., 2025; Hayamadi et al., 2024).

3. Agenda-Setting Theory

According to Kingdon (cited in Gabriel & Noak, 2022), agenda-setting theory explains how societal issues become a focus of government attention through the interaction of three streams: the problem stream, the policy stream, and the political stream. This framework helps explain the process by which the waste issue in Panca Rijang District, initially viewed as a local problem, evolved into a public issue demanding government attention.

4. Waste Handling

Under Law Number 18 of 2008, waste handling is a component of waste management comprising systematic, comprehensive, and continuous activities, specifically sorting, collection, transportation, treatment, and environmentally safe final processing (Abidin & Marpaung, 2021). A literature review identifies three categories of factors influencing waste handling policy: (a) policy and regulatory factors, including regulatory clarity, budget availability, and economic incentives (Mngomezulu & Mbanga, 2022); (b) implementation factors, including inter-party communication, resource availability, and the organizational structure of the implementing body (Ananda, 2026); and (c) community behavior factors, including knowledge, awareness, and active participation in waste sorting and recycling (Rahmawati & Wijayanti, 2024).

C. METHOD

This study was conducted in Panca Rijang District, Sidenreng Rappang Regency, South Sulawesi Province, an area selected due to the complexity of its waste management challenges, driven by a growing population and increasing household and commercial activities, alongside a collection and transport system characterized by limited frequency. The study employed a qualitative method with a descriptive approach (Sugiyono, 2023) to gain an in-depth understanding of how waste management policies are formulated, implemented, and impact the community; the researcher served as the key instrument, and data analysis was conducted inductively.

Data collection involved the triangulation of three techniques: (1) semi-structured interviews with district officials, village/sub-district administrators, sanitation workers, and community leaders regarding current conditions, influencing factors, and appropriate policy models; (2) field observations of waste management infrastructure, community behavioral patterns, and the alignment of policy implementation with regulations; and (3) a review of

documentation, including laws and regulations, local policies, activity reports, waste volume data, and collection schedules.

Data analysis employed the Miles and Huberman interactive model, comprising three stages: data reduction (selecting and focusing on data relevant to conditions, effectiveness, the roles of actors, and community participation), data display (in the form of narrative descriptions, summary tables, or matrices), and conclusion drawing and verification. The analysis process was reinforced using NVivo 12 Plus software to categorize themes and identify significant patterns, thereby ensuring a more structured and in-depth analysis.

D. RESULTS AND DISCUSSION

1. Conditions and Practices of Waste Management

Panca Rijang District occupies a strategic position as an interregional connecting route within Sidenreng Rappang Regency. This strategic location has contributed to the rapid development of governmental, commercial, educational, and public service activities, which, in turn, has increased population mobility and the daily generation of waste. Geographically, the district comprises residential areas, commercial centers, educational facilities, government offices, and agricultural land distributed across several villages and urban wards. Consequently, waste generation originates from diverse sources, including households, traditional markets, shops, public facilities, and other community activities.

The uneven distribution of the population also influences the pattern and coverage of waste collection services. Densely populated areas generate larger volumes of waste and therefore require greater availability of collection vehicles, sanitation workers, and temporary waste collection facilities. Field observations confirmed that waste collection services have not yet been provided optimally in all areas due to limited transportation capacity, particularly in densely populated residential neighborhoods. This condition demonstrates that the geographical characteristics of the district constitute an important factor that must be taken into account in formulating and implementing waste management policies.

From a demographic perspective, population growth has a direct impact on the increasing generation of household waste, which represents one of the primary sources of waste in the district. However, most residents have not yet developed the habit of sorting waste at the household level. As a result, different types of waste are commonly mixed together, thereby increasing the burden on the waste processing system at the 3R Waste Management Facilities (TPS 3R), where waste must subsequently be sorted manually by personnel. The Head of Panca Rijang District emphasized this condition during the interview:

“It remains low because most people are not yet accustomed to sorting their waste at home”. (*Interview with the Head of Panca Rijang District*)

This statement is supported by information obtained from community members, who indicated that only a small proportion of residents have begun sorting their waste, while the majority have not done so due to limited understanding and the inadequate availability of waste-sorting facilities. These findings indicate that demographic factors should not be understood solely in terms of population size, but also in relation to community characteristics and behavioral patterns concerning waste management. Without behavioral change, population growth will continue to increase the volume of waste generated and consequently pose a significant challenge to the sustainability of waste management policies.

The organizational structure of waste management is hierarchical and involves several levels of government and non-governmental actors. The Regency Environmental Agency is primarily responsible for policy formulation, budgeting, provision of waste transportation vehicles, and supervision. The district government functions as a territorial coordinator and serves as an intermediary between regional policies and the actual conditions experienced by

the community. Meanwhile, village and urban ward governments are responsible for disseminating information, encouraging community participation, and reporting field-level problems. Sanitation workers serve as the technical implementers responsible for waste collection and transportation. Beyond government institutions, the study also identified the involvement of community members, environmental organizations, TPS 3R managers, and private-sector actors, although their contributions remain relatively limited. NVivo analysis further indicates that government actors occupy the most dominant position within the overall policy network, whereas private-sector involvement has the lowest intensity. This finding suggests that multi-stakeholder collaboration in waste management has not yet developed optimally.

The conditions and practices of waste management constitute the first focus of this study and encompass a series of interconnected stages, including waste sorting, collection, transportation, processing, and final disposal. NVivo analysis of interview, observation, and documentary data indicates that waste transportation has the highest frequency of occurrence among the identified themes, followed by waste sorting, processing, and final disposal. Meanwhile, waste collection has the lowest intensity of discussion because its basic mechanism is relatively well established, although its effectiveness remains affected by limitations in infrastructure and community behavior. This finding indicates that the most significant problem encountered by both the government and the community is concentrated at the transportation stage.

Based on interviews with the Environmental Agency, the waste collection system generally operates by transporting waste from households to designated collection points, followed by transportation to temporary waste collection facilities (TPS), before ultimately being transferred to the final disposal site. However, this process continues to face significant constraints due to the limited availability of waste transportation vehicles. Consequently, waste collection services have not been able to reach all areas adequately. In addition, the utilization of TPS 3R facilities remains suboptimal because of limited community participation in sorting waste at its source.

Sanitation workers reported that waste transportation services are conducted only twice a week according to a predetermined schedule. The number of available vehicles is insufficient to accommodate the increasing volume of waste generated by the community. At certain times, this situation results in delays in waste collection, leading to waste accumulation in residential areas and subsequently affecting environmental cleanliness, public comfort, and the quality of the surrounding environment. Field observations further revealed several locations where adequate waste bins or collection facilities were not available. This condition encourages some residents to dispose of waste in inappropriate locations and indicates that the provision of waste management infrastructure still needs to be improved to ensure that residents have convenient access to proper waste disposal facilities.

Overall, although the government has implemented the various stages of waste management stipulated in the applicable policy framework, implementation remains constrained by several interrelated factors. These include low levels of community awareness and participation, limited waste transportation capacity, suboptimal utilization of TPS 3R facilities, and inadequate waste management infrastructure. The interaction among these factors indicates that improving waste management in Panca Rijang District requires not only improvements in government service capacity but also stronger community participation, behavioral change at the household level, and more effective collaboration among governmental, community, environmental, and private-sector actors.

2. Factors Influencing Waste Management Policy

NVivo analysis indicates that community behavior, policy implementation, and infrastructure support are the most frequently occurring themes across the interview data. This finding suggests that the major challenges in waste management are not primarily related to the substance of the policy itself, but rather to the effectiveness of policy implementation at the local level and the extent of community participation in waste management practices.

a. Policy and Regulatory Factors

Policies and regulations provide the legal foundation that guides the entire waste management process. They establish certainty regarding the distribution of governmental authority, service mechanisms, institutional responsibilities, and community obligations. The Head of Panca Rijang District stated that waste management practices are implemented based on local government policies:

“Yes, they refer to local government policies concerning waste management”.
(*Interview with the Head of Panca Rijang District*)

This statement is reinforced by the Environmental Agency, which confirmed that waste management policies have been formulated with reference to regional regulations and relevant national provisions. Nevertheless, from an implementation perspective, the effectiveness of these policies remains suboptimal:

“It is not yet fully effective because of low public awareness and limitations in supporting facilities”. (*Interview with the Environmental Agency*)

These findings indicate that the principal weakness does not lie in the substantive content of the policy, but rather in the government's capacity to translate policy provisions into concrete actions at the community level. Regarding the compatibility of the policy with local social conditions, the Head of Panca Rijang District considered the policy to be “quite appropriate, but it requires community participation”. Policy implementation is monitored through “field monitoring and reports from the community”. However, field observations indicate that existing monitoring mechanisms have not yet been sufficiently effective in changing community behavior, particularly regarding waste sorting and disposing of waste in designated locations.

Thus, although the regulatory framework provides an adequate foundation for waste management, its effectiveness depends heavily on the capacity of implementing institutions to enforce the provisions, conduct continuous monitoring, and encourage community compliance.

b. Policy Implementation Factors

The implementation of waste management policy in Panca Rijang District is constrained by several interrelated factors. From a budgetary perspective, the Head of Panca Rijang District stated that financial support **“is still limited compared with existing needs.”** This assessment is consistent with the Environmental Agency, which explained:

“The budget is available, but it is still limited to meet all operational needs, such as additional vehicles and facilities”. (*Interview with the Environmental Agency*)

The limited availability of waste transportation vehicles emerged as one of the most dominant implementation constraints. Almost all informants conveyed similar concerns, as reflected in the statement of a sanitation worker:

“It is not yet adequate because the number of vehicles is still limited”. (*Interview with a Sanitation Worker*)

This finding is consistent with the NVivo analysis, in which the **waste transportation** theme had the highest intensity of occurrence. This indicates that implementation problems are concentrated more heavily on operational capacity and supporting infrastructure than on weaknesses in the regulatory framework.

In addition to transportation vehicles, the number of sanitation workers remains inadequate in relation to the geographical scope of the service area. As one sanitation worker stated, the available workforce is “still insufficient compared with the size of the service area”. This shortage increases the workload of sanitation personnel, particularly during periods of increased waste generation. Consequently, limitations in both transportation capacity and human resources directly affect the consistency and coverage of waste management services.

Meanwhile, coordination among the district government, urban wards, and the Environmental Agency has generally been established through routine communication and field-level coordination. The Head of Panca Rijang District explained that coordination is “conducted through cooperation with urban wards and the community.” Nevertheless, coordination mechanisms still need to be strengthened so that operational problems can be identified and addressed more rapidly and decisions can be made in a more responsive manner.

These findings demonstrate that effective policy implementation requires more than the availability of formal regulations. Adequate financial resources, transportation facilities, human resources, and responsive intergovernmental coordination are essential for translating policy objectives into effective waste management services.

c. Community Behavioral Factors

Community behavior represents one of the most decisive factors influencing the success of waste management policy implementation. Almost all informants, including government officials, Environmental Agency personnel, sanitation workers, and community members, agreed that low levels of public awareness constitute a major reason why waste management has not yet achieved optimal results. The Head of Panca Rijang District identified “community awareness of environmental cleanliness” as the most influential factor, while the Environmental Agency emphasized that “community behavior and limited infrastructure are the most influential factors.”

The findings concerning community behavior can be further categorized into four interrelated aspects:

1). Community awareness of environmental cleanliness

Community informants assessed public awareness as “still needing improvement”. This condition is reflected in the limited practice of sorting waste at the household level and the continued occurrence of improper waste disposal, as also confirmed through field observations. Low awareness consequently reduces the effectiveness of waste management policies because residents remain insufficiently involved in the initial stages of waste management.

2). The culture of improper waste disposal

Community members attributed the practice of disposing of waste indiscriminately to “habits and the lack of waste bins in several locations”. This finding demonstrates that behavioral change cannot be pursued independently of improvements in service infrastructure. When appropriate disposal facilities are unavailable or difficult to access, residents may continue to rely on established disposal habits.

Community understanding of waste management regulations is also not yet comprehensive. As one informant explained:

“Some people know about them, while others do not yet understand them in detail”.
(Community Informant)

This condition indicates that regulatory knowledge remains unevenly distributed across the community and that policy communication needs to be strengthened through more accessible and continuous forms of public education.

3). Community participation in waste management

Community participation in waste management activities was assessed as “not yet optimal”. Some residents continue to perceive waste management primarily as a governmental responsibility rather than a shared responsibility between the government and the community. The Head of an Urban Ward added that the community “mostly supports [the program], but participation still needs to be improved.”

This finding indicates the existence of a basic level of community support, but such support has not yet been fully transformed into consistent collective action. In other words, the potential for social capital exists within the community, but it has not yet been sufficiently mobilized to support sustainable waste management practices.

4). Education and socialization

The government has undertaken education and socialization activities concerning waste management. However, the Environmental Agency acknowledged that these activities “have not yet reached the entire community on a continuous basis”, while community members stated that they “have not yet been conducted intensively.”

The consistency between these perceptions indicates that waste management education remains relatively incidental and has not yet been sufficiently institutionalized as a continuous behavioral intervention. One-off or irregular socialization activities are unlikely to be sufficient to establish sustainable waste management practices. Therefore, education and socialization should be conducted routinely and involve a broader range of stakeholders, including schools, community leaders, civil society organizations, environmental communities, and TPS 3R managers.

Overall, the findings demonstrate that the waste management challenges in Panca Rijang District are not merely technical or administrative in nature. Low awareness of waste sorting, persistent habits of improper waste disposal, limited community participation, and inadequate outcomes from public education collectively reveal that waste management is fundamentally a social and behavioral issue. Accordingly, improving policy implementation requires not only strengthening government capacity and infrastructure but also fostering sustained behavioral change and collective responsibility within the community.

3. Policy Networks in Waste Management

Policy networks represent a critical dimension of waste management because policy effectiveness is determined not only by government as the primary policymaking authority, but also by the relationships, interactions, and forms of cooperation established among multiple actors. The findings of this study identify several actors involved in waste management in Panca Rijang District, including the district government, the Environmental Agency, urban ward governments, sanitation workers, community members, TPS 3R managers, environmental organizations, and private-sector actors. However, the intensity and nature of their involvement vary considerably, indicating that the existing policy network has not yet developed into an equally distributed and fully collaborative arrangement.

a. The Role of Government

Government institutions constitute the central actors within the waste management policy network. Their roles encompass policy formulation, budget allocation, provision of infrastructure and operational facilities, community development, service delivery, monitoring, and supervision. The Head of Panca Rijang District described the district government's role as “a driver, facilitator, and supervisor of policy implementation,” while the Environmental Agency emphasized its responsibilities in “policy formulation, provision of facilities, supervision, and community education”.

These roles indicate that government institutions continue to occupy a dominant position across almost every stage of the policy process. The government not only establishes the regulatory framework but also controls the primary resources required for policy implementation. Nevertheless, the effectiveness of these functions remains constrained by limited transportation vehicles, inadequate facilities, and insufficient budgetary resources. Consequently, government dominance within the policy network does not necessarily translate into optimal service delivery, particularly in ensuring equitable access to waste management services across the entire district.

The findings therefore suggest that the government-centered structure of the existing network creates both institutional strength and vulnerability. Government leadership provides clear direction and accountability, but excessive dependence on government resources may limit the system's capacity to respond effectively when public resources are constrained.

b. The Role of the Community

As both the primary generator of waste and the principal target of waste management policy, the community occupies a strategically important position within the policy network. Community members generally express support for government programs, although their participation remains “not yet optimal.” The community also provides positive assessments of government responsiveness, as reflected in the statement: “The government is quite responsive, although not all complaints can be addressed immediately”. (*Community Informant*)

This finding indicates that two-way communication between government institutions and the community has already been established. Community members are able to communicate complaints and provide feedback regarding waste management services, while government actors respond to these concerns within the limits of their institutional capacity. However, not all complaints can be addressed promptly because of limitations in personnel, transportation capacity, infrastructure, and budgetary resources.

From a policy-network perspective, community involvement therefore remains predominantly participatory rather than collaborative. Residents are involved primarily as service recipients, sources of information, and participants in government programs, rather than as equal partners in policy formulation, implementation, monitoring, and evaluation. This distinction is important because sustainable waste management requires communities not merely to comply with government programs but also to actively participate in shaping and implementing solutions to local waste problems.

c. The Role of Environmental Communities and TPS 3R Managers

Environmental organizations and TPS 3R managers contribute to policy implementation, particularly as community-based actors involved in environmental education, awareness building, and waste processing. The Environmental Agency identified “the community, environmental groups, and TPS 3R managers” as among the non-governmental actors involved in waste management. Community members likewise acknowledged that environmental organizations “help increase public awareness of the importance of environmental cleanliness.”

These actors provide an important bridge between formal government institutions and local communities. Their proximity to residents enables them to communicate environmental messages in a more accessible manner and to encourage behavioral change at the community level. TPS 3R managers, meanwhile, have the potential to strengthen waste reduction, sorting, reuse, and recycling practices at the local level.

Nevertheless, their contribution remains geographically and institutionally limited. Not all areas have active environmental organizations, while the capacity of existing community-based waste management institutions varies. As a result, the benefits generated by these actors have not been distributed evenly across the district. Strengthening the organizational capacity,

networking, and institutional support of environmental communities and TPS 3R managers is therefore important for expanding community-based waste management practices.

d. The Role of the Private Sector

Private-sector involvement represents an important element of a collaborative approach to waste governance, yet its presence within the Panca Rijang waste management network remains particularly weak. The Head of Panca Rijang District described private-sector involvement as “very minimal,” while the Environmental Agency characterized it as “still very limited.” Existing cooperation was also considered “not yet effective because not many private-sector actors are involved.”

The limited participation of the private sector means that the financial, technological, and organizational burden of waste management remains largely concentrated within government institutions. Consequently, when government agencies encounter budgetary and infrastructure constraints, the quality and coverage of waste management services are also affected. In contrast, private-sector actors have considerable potential to contribute through infrastructure provision, investment in waste-processing technologies, recycling initiatives, logistical support, and environmentally oriented corporate social responsibility (CSR) programs. Greater private-sector involvement could therefore diversify the resource base of waste management and reduce excessive dependence on government funding and facilities.

Overall, the NVivo analysis demonstrates that the government–community relationship has the highest intensity of interaction, whereas the government–private sector relationship is the weakest. This pattern illustrates that the waste management policy network in Panca Rijang District remains predominantly government-centered, with government institutions continuing to occupy the most influential and resource-controlling position.

The existing network has therefore not yet evolved into a fully collaborative policy arrangement in which governmental and non-governmental actors share resources, responsibilities, decision-making authority, and accountability. Community members, environmental organizations, TPS 3R managers, and private-sector actors are present within the network, but their roles remain uneven and relatively limited.

This condition has important implications for the sustainability of waste management policy. A government-centered network may provide administrative clarity and facilitate policy coordination, but it is less resilient when government resources are constrained. Strengthening horizontal relationships among government institutions, communities, environmental organizations, TPS 3R managers, and private-sector actors is consequently essential. Such strengthening should move beyond merely increasing the number of participating actors toward developing meaningful collaboration based on shared responsibility, resource sharing, joint problem-solving, and continuous communication.

Accordingly, the transformation from a government-centered network toward a more inclusive and collaborative policy network is necessary to improve the effectiveness, participation, responsiveness, and long-term sustainability of waste management in Panca Rijang District.

4. Waste Management Policy Model

The policy model developed in this study represents a synthesis of the empirical findings presented above. It is constructed based on the actual conditions observed in the field and is therefore intended to be practical and applicable rather than merely conceptual. Given that the normative and regulatory framework for waste management is already in place, the proposed model emphasizes strengthening policy implementation rather than developing additional regulations. The model consists of five logically interconnected components: input, process, output, outcome, and impact.

a. Input

The input component consists of regulations, budgetary resources, human resources, infrastructure and facilities, and community awareness and support. The regulatory framework is already available through local government policies. However, several essential inputs—including budget allocations, waste transportation vehicles, waste bins, TPS 3R facilities, and the number of sanitation workers—remain insufficient to meet the actual demands of waste management services.

This condition indicates that the availability of formal regulations alone is insufficient to guarantee effective implementation. Policy objectives require adequate organizational and material resources to be translated into effective public services. Thus, strengthening the input component constitutes the initial prerequisite for improving the overall waste management system.

b. Process

The process component encompasses waste sorting, collection, transportation, processing through TPS 3R facilities, public education, and monitoring. These stages are interconnected, meaning that weaknesses at one stage can affect the effectiveness of subsequent stages. In particular, inadequate waste sorting at the household level reduces the effectiveness of processing at TPS 3R facilities, while limited transportation capacity results in delays and waste accumulation.

Although coordination among government institutions has been established, it requires further strengthening, particularly through cross-sectoral cooperation involving environmental communities, TPS 3R managers, educational institutions, and private-sector actors. Consequently, the process component requires not only improvements in operational procedures but also stronger coordination and collaboration across institutional boundaries.

c. Output

The output component includes regular waste transportation services, the availability and operation of TPS 3R facilities, increased public education and socialization, and improved coordination among government institutions. These outputs demonstrate that the government has established the basic mechanisms required to implement waste management policy.

Nevertheless, these outputs have not fully met community expectations. Delays in waste transportation, uneven distribution of waste bins and other facilities, and limited effectiveness of public education remain significant concerns. In particular, the existence of socialization programs has not yet translated into substantial behavioral changes among residents. This indicates a gap between the production of policy outputs and their effectiveness in generating the desired behavioral and environmental changes.

d. Outcome

The expected outcomes include increased community awareness and participation, reduced volumes of waste transported to final processing facilities, and stronger collaboration among policy actors. The findings indicate that these outcomes are still at an early stage and have not been achieved evenly across the district.

The achievement of these outcomes requires sustained intervention and long-term commitment from all relevant actors. Behavioral change cannot be generated through short-term socialization activities alone. It requires continuous education, accessible waste management facilities, community-based initiatives, and consistent engagement between government institutions and local communities.

e. Impact

The long-term impact of the proposed model is the creation of a cleaner, healthier, and more sustainable environment, accompanied by improved public health, reduced

environmental pollution risks, and the development of a stronger community culture of environmental responsibility.

Although these impacts have not yet been fully achieved, the implementation of government programs has generated positive indications toward their realization. The findings therefore suggest that impact should be understood as a long-term result that depends on the sustained interaction among adequate resources, effective implementation processes, measurable outputs, behavioral outcomes, and collaborative governance.

The proposed model is built upon three mutually reinforcing pillars: government capacity strengthening, community participation strengthening, and multi-actor collaboration strengthening.

The first pillar, government capacity strengthening, focuses on improving budgetary resources, waste transportation vehicles, infrastructure, and the capacity of sanitation personnel. The second pillar, community participation strengthening, emphasizes continuous education, household waste sorting, development of waste banks, and optimization of TPS 3R facilities. The third pillar, multi-actor collaboration strengthening, involves government institutions, communities, environmental organizations, TPS 3R managers, educational institutions, and the private sector.

These three pillars are interdependent. Policy effectiveness cannot be achieved if one pillar operates substantially below the required level. Adequate government resources, for example, will have limited impact if communities continue to dispose of waste improperly, while strong community participation may not be sustained if government services and supporting infrastructure remain inadequate. Similarly, both government capacity and community participation can be constrained when opportunities for collaboration and resource sharing among stakeholders remain limited.

The findings concerning waste management conditions and practices are consistent with Dunn's policy analysis perspective, which emphasizes that policy effectiveness should not be assessed solely from the existence of formal regulations but from the extent to which policy implementation is capable of addressing public problems in practice. The findings also corroborate Wahyuni and Prabowo (2022), who identified limited waste transportation capacity as a major cause of low-quality waste management services. However, this study provides an additional contribution by demonstrating that, at the subdistrict level, transportation constraints cannot be separated from the low participation of households in waste sorting. Consequently, improving waste management services requires an integrated approach that combines infrastructure provision with behavioral change rather than addressing either dimension independently.

The factors influencing policy implementation further demonstrate that regulation, implementation capacity, and community behavior are mutually interconnected and cannot be adequately explained in isolation. From a regulatory perspective, the findings reinforce Dunn's argument that policy evaluation must consider the relationship between policy objectives and the resources available to achieve them. In Panca Rijang District, policy objectives have been clearly formulated, but the organizational and operational capacity of government institutions constrains their realization.

Compared with Lestari et al. (2020), who concluded that behavioral change is a fundamental prerequisite for sustainable waste management, this study provides an additional insight: behavioral change is more likely to be effective when accompanied simultaneously by improvements in government service quality and stronger collaborative networks among stakeholders. Community participation, therefore, should not be treated as an isolated intervention but as part of an integrated policy implementation strategy.

The policy network dimension is analyzed through Rhodes' policy network theory, which emphasizes that governments cannot resolve complex public problems independently because different actors possess distinct but complementary resources. This condition, however, has not yet been fully realized in Panca Rijang District, where the policy network remains predominantly government-centered.

The concept of Heclo's issue network is also relevant for explaining the contribution of environmental communities and TPS 3R managers, particularly in public education and community awareness-building. Nevertheless, their involvement remains limited and has therefore not yet generated a substantial impact across the entire district.

Unlike many previous studies on collaborative governance, which emphasize government-private-sector partnerships as a major determinant of successful waste management, this study demonstrates that the primary challenge in Panca Rijang District is not merely the limited involvement of private-sector actors. Equally important is the underutilization of communities as key actors in reducing waste at its source. Accordingly, this study proposes a policy network structure that is more closely aligned with the characteristics of the subdistrict: government as coordinator, communities as primary actors, environmental organizations as education agents, TPS 3R as community-based processing centers, and the private sector as a supporting resource provider.

When analyzed through Dunn's policy cycle, problem identification, alternative formulation, implementation, monitoring, and evaluation, the proposed model indicates that the problem identification stage has been relatively well established. Government institutions have recognized waste management as a strategic local public issue. However, a substantial gap remains between policy objectives and actual conditions during the implementation stage.

From the perspective of Kingdon's Multiple Streams Framework, the three streams, problem stream, policy stream, and politics stream are already present. Waste management has been recognized as a public problem; the government has developed policy alternatives, including TPS 3R development and public education; and there is political and institutional support from the local government for implementation. Nevertheless, these three streams have not yet generated an optimal policy window because of resource constraints, limited community participation, and weak private-sector collaboration.

Comparison with previous studies reviewed in this research shows similarities in identifying inadequate infrastructure and low community awareness as major barriers to effective waste management. The principal difference, and at the same time the major contribution of this study, lies in demonstrating that policy effectiveness at the subdistrict level is strongly influenced by the simultaneous interaction among government implementation capacity, policy-network strength, and community behavior. These three dimensions are mutually dependent and should therefore be addressed as an integrated system rather than as separate policy variables.

The findings make several theoretical contributions. First, the study reinforces Dunn's policy analysis perspective by demonstrating that the effectiveness of public policy is strongly determined by the quality of implementation and evaluation rather than by the existence of formal policy instruments alone. Second, the study extends the application of Rhodes' and Heclo's policy network perspectives to the subdistrict level, where policy implementation remains predominantly government-dominated. The findings demonstrate that policy networks at the local level can include diverse actors, but their presence does not automatically produce collaborative governance. The quality, intensity, and distribution of relationships among actors are equally important. Third, the study extends Kingdon's Multiple Streams Framework by suggesting that the opening of a policy window at the local level depends not only on the convergence of the problem, policy, and politics streams but also on the organizational capacity

of government institutions and the level of community participation. Thus, the convergence of the three streams may be insufficient when the institutional and social capacities required to implement the resulting policy are weak.

Based on the empirical findings and the proposed policy model, this study recommends several strategic interventions:

- a. Increase the number and capacity of waste transportation vehicles and supporting infrastructure to expand service coverage and reduce delays in waste collection.
- b. Strengthen the intensity and continuity of public education concerning household waste sorting, waste reduction, and responsible waste disposal at the source.
- c. Optimize TPS 3R facilities through improvements in managerial capacity, equipment, operational support, and budget allocation.
- d. Expand partnerships with the private sector, particularly through environmentally oriented CSR programs, while involving schools, civil society organizations, and environmental communities in education and waste management initiatives.
- e. Establish a subdistrict-level waste management coordination forum as a platform for communication, coordination, joint problem-solving, and collaboration among stakeholders, with clearly defined roles and responsibilities for each actor.

Novelty of the Proposed Model

The principal novelty of this study lies in the development of a Collaboration-Based Waste Management Policy Model at the Subdistrict Level. Unlike previous studies that predominantly focus on waste management at the regency, municipal, or city level, this model specifically addresses the institutional and social characteristics of subdistrict governance.

The proposed model integrates government implementation capacity, policy-network strengthening, and community participation into a single, mutually reinforcing framework. Government is positioned as the coordinator and facilitator; communities are recognized as the primary actors in waste reduction at the source; environmental organizations function as agents of education and social mobilization; TPS 3R facilities serve as community-based waste processing centers; and the private sector contributes complementary resources, technology, and investment.

This integrated configuration provides both a conceptual and practical contribution to waste management policy. Conceptually, it demonstrates that effective waste management at the local level is not determined by a single factor but by the interaction of institutional capacity, stakeholder relationships, and community behavior. Practically, it provides a context-sensitive framework that can guide subdistrict governments in translating existing waste management regulations into more effective, participatory, collaborative, and sustainable policy implementation.

E. CONCLUSION

This study reveals that waste management in Panca Rijang District encompasses all stages of the management cycle, sorting, collection, transportation, processing, and final disposal, through various government programs; however, implementation remains suboptimal. Key issues include sorting at the household level, fleet limitations, unequal distribution of facilities, and the utilization of 3R-TPS (Reduce-Reuse-Recycle Waste Processing Sites). Policy effectiveness is influenced by three interconnected factors: policy and regulations (where the legal basis is clear but implementation remains limited), implementation (constrained by fleet, budget, human resources, and infrastructure), and community behavior (the most dominant factor, encompassing awareness, habits, and participation). Regarding the policy network, the government remains the dominant actor, while the involvement of the public, community groups, and the private sector is not yet optimal. The recommended

approach is a Collaborative Waste Management Policy Model, which positions the government as a coordinator and facilitator; the community as the primary actor in waste reduction at the source; 3R-TPS operators as community-based processing hubs; environmental groups as agents of education; and the private sector as a partner providing resources and innovation. This model comprises five components: inputs, the implementation process, outputs, outcomes, and impact.

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