



# Political Ecology Evaluation of Waste Management Policy in Banjarmasin City

Hendra Hendra \*, Deasy Arisanty

Development Studies Program, Lambung Mangkurat University, Indonesia

\*Email (corresponding author): [2441212310003@mhs.ulm.ac.id](mailto:2441212310003@mhs.ulm.ac.id)

**Abstract.** *Rapid urbanization in Banjarmasin City has intensified domestic waste management challenges, posing a significant obstacle to achieving Sustainable Development Goals (SDGs), particularly those related to urban environmental governance. Despite the enactment of Regional Regulation No. 21/2011 promoting the 3R (Reduce, Reuse, Recycle) principles, its implementation remains fragmented and has failed to engage comprehensive community participation. This study adopts a political ecology framework to critically assess the effectiveness of the policy, emphasizing structural barriers such as institutional fragmentation, limited technological adoption, and imbalanced stakeholder power relations. A qualitative case study approach involved in-depth interviews with key stakeholders, document analysis, and field observations. Thematic analysis and triangulation methods were used to validate findings. Results indicate Banjarmasin's waste governance remains largely technocratic and top-down, with inadequate grassroots integration and weak inter-agency coordination. Technological innovations such as digital monitoring and Waste-to-Energy solutions are notably absent, further limiting policy outcomes. This study highlights the urgency of reforming local waste governance through participatory, equitable, and technologically adaptive strategies, particularly for medium-sized cities in the Global South.*

**Keywords:** *Waste governance, local regulation, political ecology, stakeholder participation, sustainable urban development*

## 1. Introduction

The rapid urbanization in Banjarmasin over the past decade has introduced multidimensional challenges in urban environmental management, particularly domestic waste governance. Effective waste management is not merely a matter of environmental concern—it also serves as a proxy indicator for public health, economic stability, and sustainable urban governance, aligning with several targets within the Sustainable Development Goals (SDGs)(1,2). According to the 2023 report by Banjarmasin's Environmental Agency, the city generates approximately 650 tons of waste daily, primarily consisting of organic waste (55%) and plastics (25%). These statistics underscore an urgent need for waste management strategies beyond technical responsiveness, incorporating structural and social adaptability.

In response to these growing challenges, the Banjarmasin City Government enacted Regional Regulation No. 21 of 2011 to promote 3R principles (reduce, reuse, recycle) and expand the development of waste infrastructure such as Temporary Waste Disposal Sites (TPS) and Integrated Waste Processing Sites (TPST). However, empirical evidence suggests that policy implementation remains far from optimal. Structural limitations persistently

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hinder policy outcomes, including under-resourced institutions, constrained fiscal budgets, and insufficient community engagement (3). Prasetyo (4) limited procedural success but highlighted the inadequate community participation, particularly in areas where illegal dumping continues due to insufficient facilities and weak public outreach. Suhaimi and Setyawan (5) further observe a lack of institutional coordination and mechanisms for strengthening community-based waste management, ultimately undermining key tenets of sound environmental governance.

These implementation failures are symptomatic of a broader disconnect between technical solutions and sociopolitical realities. Wilson et al. (2) assert that top-down waste governance frameworks in developing contexts frequently overlook local dynamics and marginalize grassroots actors. In Banjarmasin, the practice of 3R remains symbolic mainly and ceremonial rather than genuinely transformative (6). In contrast, international cases demonstrate the potential of participatory governance – Agovino et al. (7). Explain how collaborative institutional frameworks in Italy significantly enhance household waste sorting and collection, reaffirming the importance of inclusive governance.

A global comparison reveals stark disparities. South Korea successfully reduced its reliance on landfills from 80% in 1990 to 20% in 2020 through the robust implementation of Extended Producer Responsibility (EPR) schemes and fiscal incentives (8). The European Union, through its Circular Economy Action Plan, has set ambitious recycling targets of 65% by 2035, facilitated by advanced Waste-to-Energy (WtE) systems (9). Meanwhile, Indonesia continues to struggle with local policy implementation, limited technological innovation, and inadequate public financing, particularly in efforts to reduce plastic waste (10).

In Banjarmasin, digital integration remains notably underutilized. IoT-based sensors, predictive analytics, and integrated monitoring platforms have not yet been adopted. A systematic review by Czekala, Drozdowski, and Labiak (11) highlights the transformative role of such technologies in improving waste system responsiveness. However, studies by Wicaksana et al. (12) and Ilham (13) suggest that Banjarmasin's waste system remains manual and labor-intensive, resulting in higher operational costs and lower recycling efficiency.

Given these gaps, this study aims to critically assess the effectiveness of Regional Regulation No. 21/2011 in achieving sustainable waste governance in Banjarmasin, utilizing the analytical lens of political ecology. This approach enables the exploration of structural barriers, including deficient infrastructure, weak community engagement, limited technological integration, and asymmetrical power dynamics among stakeholders.

Political ecology has emerged as a key framework for bridging environmental and sociopolitical analyses (14). It interrogates how control over space, resources, and policymaking is disproportionately exercised by dominant political or economic actors (15). From this perspective, environmental degradation and governance failures are seen not simply as technical issues but as outcomes of embedded power asymmetries, which manifest through top-down decision-making and the systematic exclusion of non-state stakeholders (16) (14). These power dynamics also shape the distributive injustices of waste governance, where informal actors often bear the ecological burdens while lacking access to decision-making spaces (2).

The novelty of this study lies in its interdisciplinary approach, integrating local policy evaluation with critical political ecology theory to unpack the structural conditions that constrain sustainable waste governance. Unlike previous research that isolates technical or procedural elements, this study foregrounds the stakeholder dynamics and power

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configurations that perpetuate inefficiencies and injustices. By focusing on Banjarmasin as a medium-sized urban area in the Global South, the research fills a critical gap in the literature regarding the intersection of institutional capacity, civic participation, and ecological equity in waste governance.

Ultimately, this study contributes to the broader discourse on sustainable urban development and participatory environmental governance. Its findings offer evidence-based recommendations for institutional reform and community engagement strategies that promote a more inclusive, just, and resilient municipal waste system.

## 2. Methods

This study adopted a qualitative case study methodology to evaluate the implementation of Regional Regulation No. 21/2011 concerning waste management in Banjarmasin, Indonesia, using political ecology as the analytical framework. This approach was chosen to enable an in-depth examination of stakeholder dynamics, power relations, and structural constraints affecting waste governance in an urban Global South context.

The research was conducted at three primary locations: the Office of the Environmental Agency (DLH), several Temporary Waste Disposal Sites (TPS) and Integrated Waste Processing Sites (TPST), and selected community-based waste banks in North, Central, and South Banjarmasin. The unit of analysis consisted of interactions among three primary stakeholder groups – government institutions, civil society (particularly local communities), and the private sector – about applying the 3R (Reduce, Reuse, Recycle) waste management principles.

Data collection utilized a combination of primary and secondary sources. Primary data were obtained through semi-structured interviews with ten key informants: four DLH officials, three community waste bank managers, two recycling entrepreneurs, and one academic expert in environmental policy. Each interview was guided by open-ended questions designed to capture stakeholders' perceptions, challenges, and aspirations regarding waste governance. Additionally, participatory field observations were conducted at TPS/TPST locations to assess the operational aspects of waste segregation, collection, and treatment directly.

Secondary data included a review of relevant regulatory documents, specifically Regional Regulation No. 21/2011, annual performance reports from the DLH (2020–2023), and public education materials on the 3R program. All data were analyzed thematically, with triangulation applied across interview transcripts, observations, and document analyses to ensure validity and reliability of findings.

This study acknowledges two primary limitations. First, full access to disaggregated budgetary data for the environmental sector in 2023 was restricted, limiting financial analysis of policy implementation. Second, the findings are context-specific to Banjarmasin, a city with unique geographic and socio-cultural characteristics, such as deltaic morphology and river-based settlements, limiting broader generalizability.

## 3. Results and Discussion

This study evaluates the implementation of waste management policy in the City of Banjarmasin, with a specific focus on the 3R principles (reduce, reuse, recycle) as outlined in Regional Regulation No. 21 of 2011. Field findings reveal that the policy has not yet been implemented effectively or equitably due to persistent structural challenges, limited public

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participation, power asymmetries among stakeholders, and the absence of technological innovation. The following subsections explore these four key issues in greater depth.

### 3.1. Infrastructure Deficiencies and Institutional Discoordination

This study identifies inadequate infrastructure as one of the primary obstacles in implementing Regional Regulation No. 21/2011 on Waste Management in Banjarmasin. With daily domestic waste production reaching approximately 650 tons, the existing infrastructure falls short of supporting the operational demands. Field data reveal significant disparities in the distribution of Temporary Waste Disposal Sites (TPS) across districts. Central urban districts are equipped with a greater number of TPS facilities, while peripheral areas suffer from limited or nonexistent access to waste services, leading to gaps in service coverage and increased reliance on illegal dumping (17)

The current infrastructure conditions further indicate that many TPS facilities are damaged, lack basic waste separation features, or operate beyond their intended capacity. This has led to frequent waste overflow, resulting in environmental disturbances such as foul odors, insect infestations, and the contamination of surrounding soil and water sources. A Banjarmasin Environmental Agency (DLH) staff member acknowledged the issue: "We struggle to meet community demands for new TPS facilities or fleet repairs due to limited budget allocations. As a result, we can only make minimal repairs, and the same waste problems keep recurring." (DLH Officer, interview, 2025)

The situation aligns with Vergara and Tchobanoglous's analysis (18), which argues that effective waste management requires adequate technical infrastructure and sustained fiscal capacity. In Banjarmasin, budgetary constraints present a major obstacle to maintaining and expanding waste management facilities. The Final Report on Waste Management Planning (17) confirms that the municipal solid waste budget allocated through the Banjarmasin city budget (APBD) remains suboptimal.

In addition to conventional TPS facilities, implementing 3R-based waste sorting centers (TPS3R) faces serious challenges in public outreach and operational management. Interviews with community leaders revealed that most residents lack a clear understanding of household-level waste sorting schemes. The absence of technical guidelines and weak community facilitation were cited as key reasons for low public participation (Interviews with Community Leaders 1 & 2, 2025).

Poor inter-agency coordination is a critical factor behind Banjarmasin's ineffective implementation of waste policies. Field observations indicate that the absence of regular coordination forums among stakeholders, such as the Environmental Agency (DLH), sub-district and neighbourhood units, private operators, and civil society, has resulted in fragmented and sectoral waste handling efforts. One DLH official noted, "Each agency seems to be working in isolation. There are no routine coordination meetings regarding waste issues. As a result, whenever a problem arises, it's tough to resolve it collectively." (DLH Official, interview, 2025)

This condition is consistent with Wilson et al. (2), who emphasize that top-down waste management approaches in developing countries often fail due to a lack of collaboration and coordination. Robbins (14) argues that weak institutional coordination reflects managerial dominance, where decision-making remains centralized and excludes local actors. Guerrero et al. (19) echo these findings, emphasising that weak institutional frameworks, insufficient

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infrastructure, and fragmented coordination are systemic obstacles commonly encountered in waste management systems in developing countries.

### 3.2. Symbolic Public Engagement and Participation Gaps

This study reveals that public participation in waste management in Banjarmasin remains low and largely symbolic. Although Regional Regulation No. 21/2011 mandates the adoption of the 3R principles, community involvement has not been effectively realized. In-depth interviews indicate several contributing factors: insufficient education campaigns, lack of economic incentives, and weak policy-practice integration. A community leader stated, "Most residents don't fully understand the benefits of separating waste. They see it as troublesome, especially when the collectors mix everything back in one truck." (Community Leader, interview, 2025)

This highlights a systemic flaw in technical support mechanisms. Mutobe et al. (6) argue that participation in developing countries often fails due to inadequate infrastructure and incentives. PTMP Banjarmasin (17) further notes that programs like Surung Sintak and 3R campaigns have not effectively reached marginalized communities. As a DLH official stated, "Outreach is sporadic and fails to reach all segments. Many residents still do not know how to sort waste." (DLH Officer, interview, 2025)

From a political ecology perspective, symbolic participation occurs when communities only engage in appearances. Robbins (14) notes that this dynamic reflects centralized environmental governance models in which locals are passive recipients. Wilson et al. (2) that effective participation relies on inclusive, community-based forums, which are lacking in Banjarmasin.

Beaurain et al. (20) further reinforce(20) this by arguing that the success of circular economy initiatives depends not only on policy and technical measures but also on the cultural dimensions that shape community engagement and collective environmental behavior. Their pragmatist perspective highlights that local cultural values, trust dynamics, and everyday practices must be integrated into policy frameworks to ensure effective and sustainable waste governance.

### 3.3. Technological Lag and Governance Inefficiencies

The study finds that technology utilization in Banjarmasin's waste governance remains underdeveloped. This has created inefficiencies in collection, sorting, processing, and data reporting. A DLH officer noted, "We still rely heavily on manual methods. We do not have real-time monitoring or automatic sorting. Our data is often inaccurate and delayed." (Technical Officer, DLH, interview, 2025)

Cities with successful systems adopt IoT and digital data platforms [9]. PTMP Banjarmasin [2] confirms local systems remain manual and disconnected. Furthermore, WtE and composting technologies are not widely implemented. A DLH officer explained, "We're interested in WtE, but high investment and lack of skilled personnel are barriers." (DLH Officer, interview, 2025)

Ferronato(20) emphasizes that institutional capacity is key to adopting sustainable technologies. From a political ecology viewpoint, underutilized technology indicates centralized technocracy 14(14). Banjarmasin's decision-making excludes private and grassroots actors from technology adoption planning.



Incineration, increasingly used in cities like Surabaya and Jakarta, can reduce landfill burdens. However, it must be adopted with transparency and public dialogue (9). To enhance technology use, Banjarmasin should pursue integrated digital systems, capacity building, and public-private partnerships (PPPs).

These findings are consistent with broader global trends observed by Kaza et al. (21), who highlight that waste governance in Global South cities often faces persistent underinvestment in digital infrastructure and systemic capacity gaps. Zaman and Lehmann (22) further emphasize the need for an integrated Zero-Waste framework to shift urban waste management from reactive to proactive systems.

Hsu et al. (23) also emphasize the multidimensional challenges of achieving sustainability in Waste-to-Energy systems, particularly in developing countries, and stress the need for integrated approaches that combine environmental, technical, and governance perspectives to ensure long-term viability.

Recent research also highlights the growing relevance of blockchain technology as a transformative tool for enhancing transparency, traceability, and accountability in waste management systems. Blockchain, when integrated with IoT and smart contracts, can strengthen data integrity and facilitate decentralized monitoring in urban waste governance (24)

### 3.4. Stakeholder Power Imbalances and Managerial Dominance

The final finding concerns stakeholder power asymmetries. Despite Regional Regulation No. 21/2011 advocating multi-stakeholder collaboration, governance remains dominated by DLH. Informal actors like waste pickers and community waste banks are excluded from strategic decisions. As one manager stated, "We're only involved in public events, not policy planning." (Waste Bank Manager, interview, 2025)

Robbins (14) describes this as "managerial environmentalism," where governance is centralized and technocratic. Waste pickers, although essential, lack official recognition and face marginalization. Wilson et al. (2) emphasise that informal actors must be integrated for cost-efficient and effective systems.

Field observations show top-down decision-making persists in siting TPS3R and allocating programs like Surung Sintak. Local voices are overlooked. An urban village head remarked, "We just get letters. No one asks whether the location fits our context." (Urban Village Head, interview, 2025)

Banjarmasin exemplifies procedural, not substantive, participation. Arnstein's (25) Ladder of Citizen Participation illustrates the difference. True transformation requires inclusive forums and shared power.

Banjarmasin must decentralize decision-making, recognize informal roles, and promote inclusive, transparent forums to achieve sustainable and equitable waste governance. As Robbins (14) states, "Effective policies recognize power, diversity, and social equity – not just efficiency."

## Conclusions

This study critically evaluated the implementation of Regional Regulation No. 21/2011 in Banjarmasin using a political ecology framework to interrogate structural challenges in municipal waste governance. The findings indicate that the policy has not achieved its intended sustainable, equitable, and participatory waste management objectives.

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Four interrelated barriers – inadequate infrastructure, symbolic public participation, limited technological integration, and entrenched stakeholder power asymmetries – have collectively hindered progress.

Infrastructure remains unevenly distributed, particularly disadvantaging peripheral communities, while institutional coordination across agencies is weak and fragmented. Public engagement initiatives are mainly ceremonial and fail to embed community ownership. Furthermore, the absence of digital systems and advanced processing technologies reflects fiscal constraints and centralized decision-making practices that exclude private and civil actors. These governance failures are embedded in unequal power relations, wherein non-state stakeholders – especially those from informal and community sectors – remain peripheral to strategic decision-making.

The study underscores the need for a transformative shift in governance that moves beyond technocratic fixes toward inclusive, participatory, and decentralized models. Key recommendations include (1) formalizing cross-sector coordination mechanisms, (2) expanding sustained community education and incentive programs, (3) investing in digital monitoring systems and scalable technologies, and (4) redistributing decision-making authority to include civil society and informal actors.

By adopting a political ecology lens, this research contributes to theoretical advancements in environmental governance while offering practical insights for mid-sized cities in the Global South striving for inclusive and resilient urban sustainability. Future research should investigate how local political economies and institutional legacies shape environmental reforms across decentralized urban systems.

### Funding

This research received no external funding.

### Acknowledgments

The author would like to thank the Environmental Agency of Banjarmasin City (DLH), local waste bank managers, and community leaders in North and South Banjarmasin for their cooperation and insights throughout the data collection process. Appreciation is also extended to the academic supervisors at Universitas Lambung Mangkurat for their valuable guidance during the development of this study.

### Conflicts of Interest

The authors declare no conflict of interest.

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