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Waste-to-Energy Policy Governance in Makassar City: An Analysis of Institutional Readiness

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ABSTRACT

The Indonesian government has promoted waste-to-energy as an answer to overloaded landfills, but a plant can only work if local institutions turn national mandates into coordinated and durable action. This article examines how ready Makassar City is to govern a waste-to-energy plant. Building on the collaborative governance framework and on the implementation barriers reported in the waste-to-energy literature, we analysed eleven official and media documents published between 2018 and 2026 and rated institutional readiness on seven dimensions: legal basis, intergovernmental coordination, financing and electricity purchase, site and land, upstream waste management, public legitimacy, and organizational capacity. Formal arrangements are the most mature part of the system. A cooperation agreement now binds the South Sulawesi provincial government, Makassar City, Gowa Regency, and Maros Regency, and the environment ministry coordinates the project directly. Readiness across the other dimensions is uneven. The planned plant of 1,000 tonnes per day would absorb about 61 percent of the 1,644 tonnes generated daily in the metropolitan area, leaving roughly 39 percent to source separation and landfill improvement, the two areas where progress is weakest. The financing scheme and the legal mechanism have changed several times, the site is still debated, and civil society objections to waste combustion remain unresolved. The documents offered no direct evidence on organizational capacity. We conclude that Makassar is held back less by missing rules than by weak upstream management, an unstable project design, and unsettled legitimacy. The article contributes a documented readiness profile that other cities in the national waste-to-energy program can adapt and test.

INTRODUCTION

Solid waste has become one of the hardest public services for Indonesian cities to deliver. Open dumping and open burning remain the default disposal routes across much of the developing world. Their costs for soil, water, air, and the health of people who work on disposal sites are well documented (Ferronato & Torretta, 2019). Indonesian landfills follow the same pattern, and their landfill gas potential remains largely untapped (Andriani & Atmaja, 2019). Makassar shows the problem in concentrated form. Tamangapa, the largest landfill in eastern Indonesia, has exceeded its capacity and still receives mixed waste that is buried without treatment (Muis, Al Fariz, et al., 2024). Against this background, the central government has promoted waste-to-energy, the conversion of municipal solid waste into electricity, as a way to shrink landfill volumes while producing power.

The policy has a long history. Presidential Regulation No. 18 of 2016 named Makassar among the cities selected for accelerated plant construction. After environmental groups challenged that instrument, the government replaced it with Presidential Regulation No. 35 of 2018, which kept the accelerated program in place (Suryawan et al., 2023). Makassar was expected to convert part of its waste into energy by 2025 (Muis, Rachman, et al., 2024). Progress has nevertheless been slow. Studies of public–private waste-to-energy projects point to a familiar set of obstacles: uncertain revenue, doubts about government payment commitments, and local opposition (Raharja et al., 2025). Experience in Malaysia shows that environmental, financial, and public acceptance problems have to be handled together rather than one at a time (Yong et al., 2019). The technology may be mature, yet the institutions meant to deliver it often are not.

Engineering research on Makassar has already mapped the technical options. A life cycle assessment for the city found that the scenario with the lowest environmental impact combined incineration with composting and landfill gas recovery (Muis, Rachman, et al., 2024). Sampling at Tamangapa found plastic shares of 14 to 31 percent in different landfill zones, with a calorific value high enough to make energy recovery worth considering (Muis, Al Fariz, et al., 2024). Other work has linked the city's zero-waste ambitions to energy recovery and to sustainable development targets (Saleh et al., 2020). These studies tell us what a plant could achieve. They cannot tell us whether the agencies responsible for the project are able to deliver and sustain it.

Research on waste-to-energy in Indonesia increasingly treats technology as only part of the story. Surveys in Jakarta show that residents' acceptance of a plant depends on their knowledge of the technology, their education, and the economic benefits they expect (Suryawan et al., 2023). Residents are more willing to accept change when local governments make firm policy commitments (Tehupeiory et al., 2023). Community participation in waste policy grows when residents are empowered and socially active (Brotosusilo et al., 2020). At Jakarta's Bantargebang landfill, modelling showed that recovering landfill gas for electricity could cut methane emissions and generate revenue (Kurniawan et al., 2022). Broader reviews add two cautions. Energy recovery should complement, not displace, prevention and recycling in the waste hierarchy (Pires & Martinho, 2019). Its environmental gains also depend on how it interacts with the rest of the waste system (Istrate et al., 2020). Taken together, this literature locates success in the fit between plants and the institutions around them.

Two gaps remain. First, most studies of waste-to-energy governance in Indonesia concentrate on Java, and no study has examined the Makassar project from a public administration perspective. Second, few studies make institutional readiness explicit. By institutional readiness we mean whether the legal, organizational, financial, and social arrangements needed to deliver a plant exist and hold together. We address both gaps using the collaborative governance framework of Ansell and Gash (2008). The framework identifies starting conditions, institutional design, facilitative leadership, and the collaborative process as the elements that decide whether arrangements among different actors produce results. Later work shows that collaboration most often stalls at implementation, where shared understanding has to be turned into service delivery across organizational boundaries (Bianchi et al., 2021).

Studies from South Sulawesi show why this lens fits. In Watampone, stakeholders shared a vision for waste management but could not convert it into joint action without stronger policy intervention (Gafur et al., 2023). In Makassar, collaborative management of green open space worked where roles were defined, supporting policies existed, and private partners committed funds, while staff shortages remained a constraint (Asyifa T. et al., 2025).

Human resource shortages and land problems likewise slowed land registration in the city (Asyifa T, 2023).

This article therefore asks how ready Makassar's institutional arrangements are to govern a waste-to-energy plant, and which dimensions of those arrangements are the most and least developed. It has three objectives: to trace the policy trajectory of the Makassar project, to assess institutional readiness across seven dimensions, and to identify where policy action is most needed. The contribution is a documented readiness profile for a fast-growing city in eastern Indonesia. Other cities in the national waste-to-energy program can adapt the profile's framework.

METHOD

We used a qualitative descriptive design based on documentary analysis. The unit of analysis is the institutional arrangement for the waste-to-energy project in Makassar City, including the national, provincial, and local actors named in the sources. Documentary analysis suited the purpose for two reasons. The regulations, agreements, and public statements that define the project are recorded in official and media documents, and the project was still in preparation during the study period, so no operating facility could be observed.

Institutional readiness was assessed across seven dimensions. Six were derived from the collaborative governance framework of Ansell and Gash (2008), which treats starting conditions, institutional design, and the collaborative process as the conditions that shape whether multi-actor arrangements produce results, and from the barriers reported in studies of waste-to-energy implementation in Indonesia (Bociaga, 2026; Iresha et al., 2026; Maddi, 2024; Tampubolon et al., 2025). A seventh dimension, organizational and human resource capacity, was added because earlier studies of Makassar identify it as a recurring constraint on local implementation (Asyifa T, 2023; Asyifa T. et al., 2025). Table 1 defines each dimension, its focus of analysis, and the analytical anchor that guided coding.

Table 1. Readiness dimensions and analytical anchors

Dimension	Focus of analysis	Analytical anchor
Legal basis	Presence, scope, and stability of national and regional regulation	Policy implementation (Maddi, 2024)
Intergovernmental coordination	Formal agreements and coordinating bodies among national, provincial, and local governments	Institutional design (Ansell & Gash, 2008)
Financing and electricity purchase	Source of investment, subsidy or tariff arrangement, and off-taker	Implementation barriers (Bociaga, 2026)
Site and land	Location decision and land availability	Starting conditions (Ansell & Gash, 2008)
Upstream waste management	Waste generation, sorting, landfill condition, and feedstock supply	Feedstock and governance (Iresha et al., 2026; Tampubolon et al., 2025)
Public legitimacy	Stakeholder positions, opposition, and participation forums	Collaborative process (Ansell & Gash, 2008)
Organizational and human resource capacity	Staffing, technical competence, and capacity of implementing agencies	Local capacity (Bociaga, 2026; Asyifa T et al., 2025)

Source: author's synthesis, 2026

The corpus consists of eleven documents published between 2018 and 2026. Two are legal sources on Presidential Regulation No. 35 of 2018 (JDIH Kemenko Infrastruktur, n.d.; Sekretariat Kabinet Republik Indonesia, 2018), two are releases from the Ministry of

Environment (Kementerian Lingkungan Hidup, 2026a, 2026b), and seven are reports from national and regional news outlets (Antara, n.d.; detikSulsel, 2023; Metro TV, 2026; Nurfaisah, 2024; RRI, n.d.-a, n.d.-b, 2026). We located the documents through web searches in October 2026, using Indonesian and English terms for the Makassar waste-to-energy project (PSEL Makassar), the Tamangapa landfill, and the relevant presidential regulations. A document was included if it came from a government body or an established news organization, concerned the Makassar project or its legal basis, and reported actors, decisions, or events. We excluded social media posts, opinion columns, and items without an identifiable publisher. Three news items carry no visible publication date and are cited as undated.

Analysis proceeded in three steps. First, we read each document in full and coded statements about actors, decisions, and events to the dimensions in Table 1. Second, we ordered the coded material by date to reconstruct the policy trajectory of the project from 2016 to 2026. Third, we rated each dimension using four categories. A dimension was rated Established when a formal instrument was in place and reported consistently in recent sources, Developing when an instrument existed but had been revised or was incomplete, Weak when the sources documented a major gap or sustained contestation, and Evidence gap when the sources contained no direct evidence.

To limit bias, we cross-checked claims across documents where possible and present figures reported by officials as reported. The approach has limits. Official releases and press reports can carry promotional framing, the ratings are interpretive and were assigned by a single coder, and the analysis covers the public record only, not internal decision-making. The study used publicly available documents and involved no human participants, so no consent procedure was required.

RESULT AND DISCUSSION

The findings follow the dimensions defined in Table 1. For each dimension, we present the documentary evidence and discuss it against the literature in the same place, so that the interpretation stays close to the material it rests on. Figure 3 at the end of the section consolidates the ratings. All ratings are our interpretive judgments based on the documents analyzed.

Legal mandate and policy milestones

The national mandate for waste-to-energy in Makassar is long-standing. Presidential Regulation No. 18 of 2016 covered seven cities, including Makassar (JDIH Kemenko Infrastruktur, n.d.). Its successor, Presidential Regulation No. 35 of 2018, was signed on 12 April 2018. It kept Makassar on the list of accelerated regions, allowed the governor or mayor to assign a regional enterprise or to select a business entity through competition, and created a national coordination team (Sekretariat Kabinet Republik Indonesia, 2018). In a more recent statement, the mayor explained that the building mechanism was being adjusted following the shift from Presidential Regulation No. 35 to No. 109 (RRI, n.d.-b). The intent of national policy has stayed constant for a decade, while the mechanism for delivering it has changed at least twice (Figure 1).



Figure 1. Milestones in Makassar's waste-to-energy policy, 2016–2026
Source: JDIH Kemenko Infrastruktur (n.d.); Sekretariat Kabinet Republik Indonesia (2018); detikSulsel (2023); Nurfaisah (2024); Metro TV (2026); Kementerian Lingkungan Hidup (2026a, 2026b). The orange marker denotes contestation. PKS = cooperation agreement; RDF = refuse-derived fuel

This pattern matters for implementation. Maddi (2024) links waste-to-energy outcomes in Indonesia to the way national policy is translated into local administrative and financial arrangements, and reports that such obstacles delayed one Jakarta facility. Ansell and Gash (2008) treat clear ground rules and a transparent process as part of the institutional design that allows partners to commit. When the rules on who procures, who builds, and who pays are rewritten, local partners must renegotiate roles they had only just accepted. Investors read the same signal. Reviews of public–private waste-to-energy projects rank revenue uncertainty and the reliability of government commitments among the main risks that deter private capital (Raharja et al., 2025). The 2016 to 2018 transition also shows that legal change can follow public contestation, since the earlier regulation was replaced after environmental groups challenged it (Suryawan et al., 2023). We therefore rate the legal basis as Developing. The mandate itself is not in doubt, but its operating rules have not yet settled.

Project design, financing, and intergovernmental coordination

The project design changed markedly between 2024 and 2026. In September 2024 the city government reported a cooperation agreement with a private consortium covering two sites, Tamangapa Antang and Tamalanrea, with a combined capacity of 35 MW, an investment value of IDR 3.1 trillion, and groundbreaking planned for the end of that year (Nurfaisah, 2024). By April 2026 the arrangement had become regional. A cooperation agreement among the South Sulawesi provincial government, Makassar City, Gowa Regency, and Maros Regency committed the parties to a single plant processing 1,000 tonnes per day, of which Makassar would supply 800 tonnes, Gowa 150 tonnes, and Maros 50 tonnes (Kementerian Lingkungan Hidup, 2026a). Other reports describe central government investment of about IDR 3 trillion, procurement handled directly by Danantara, and a 20 percent subsidy on electricity purchase that applies to waste-to-energy plants nationwide (Antara, n.d.). In August 2026 a coordination meeting involving the minister, the governor, and the cement producer PT Semen Tonasa as a prospective off-taker added refuse-derived fuel as a second technology route (Kementerian Lingkungan Hidup, 2026b). None of the documents reports an operating plant.

Two readings of this shift are possible, and both have support. Regionalisation pools feedstock from three local governments and places the most expensive tasks with the national government, which has more fiscal room and procurement experience. In collaborative governance terms, the four-party agreement is a formal institutional design that defines contributions and creates a forum for coordination (Ansell & Gash, 2008). The same move, however, separates the decision to build from the agencies that must supply waste every day. Implementing collaborative arrangements depends on linking service policy to service delivery (Bianchi et al., 2021), and in this case delivery still rests with city and regency agencies

that collect, sort, and transport waste. Financing also remains in motion. Bociaga (2026) identifies complications in power purchase agreements with the state utility as a recurring barrier to waste-to-energy projects in Indonesia. The purchase subsidy reduces part of the revenue uncertainty that reviews identify as the leading risk for public–private projects (Raharja et al., 2025), yet the change from a private consortium to central procurement means the commercial terms have been rewritten within two years. The refuse-derived fuel route adds another layer. Cement kilns accept such fuel only when it meets specifications on moisture, calorific value, and contaminants, which in turn requires reliable pre-sorting (Tihin et al., 2023). We rate intergovernmental coordination as Established and financing and electricity purchase as Developing.

Waste base, feedstock, and upstream readiness

National data for 2025 put waste generation in the Makassar metropolitan area at 1,644 tonnes per day (RRI, 2026), while the environment minister has referred to nearly 2,000 tonnes per day (Kementerian Lingkungan Hidup, 2026a). Measured against the lower figure, the planned plant would absorb about 61 percent of daily generation and leave 644 tonnes per day, or 39.2 percent, to be handled by other means (Figure 2). Against the minister's figure, the uncovered share rises to roughly half. The city has prepared 10 hectares of land at Tamangapa, of which 7 hectares are earmarked for the plant (Antara, n.d.).

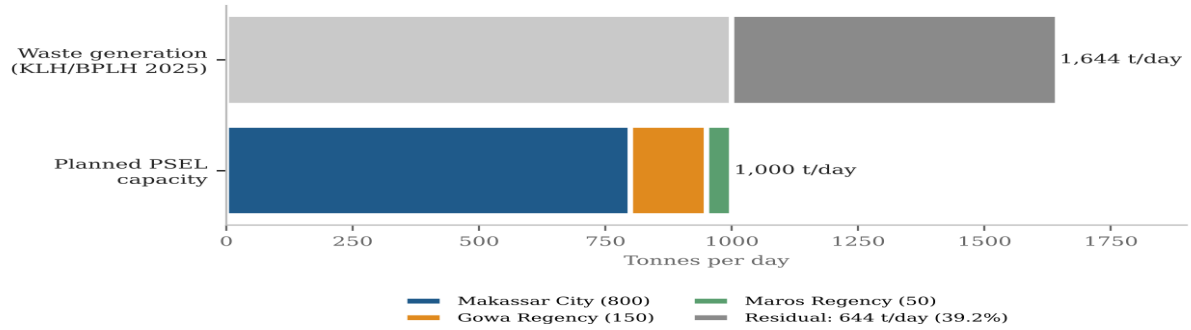


Figure 2. Planned plant capacity compared with daily waste generation
Source: Kementerian Lingkungan Hidup (2026a); RRI (2026); authors' calculation. PSEL = waste-to-electricity plant; t/day = tonnes per day

Upstream management is the weakest part of the system. The ministry describes Tamangapa as overloaded and operated as an open dump (Kementerian Lingkungan Hidup, 2026a). The city is working to lift an administrative sanction for that practice, reports that its upgrade to a sanitary landfill has reached 93 percent, and promotes household sorting to reduce incoming volumes (RRI, n.d.-a). The mayor has also estimated that 20 to 25 percent of the waste already in the landfill could serve as plant feedstock (Antara, n.d.). That estimate is plausible on technical grounds. Drilling at Tamangapa found that plastics make up a substantial share of buried waste and carry a high calorific value (Muis, Al Fariz, et al., 2024), and excavated waste from other Indonesian dumpsites has shown real energy recovery potential (Lokahita et al., 2019). Excavated material, however, needs cleaning and pretreatment before it can be burned, and fresh Indonesian municipal waste often falls below the calorific value that incinerators require because of its high organic and moisture content (Suryawan et al., 2023).

These facts point to a design tension. A plant sized at 1,000 tonnes per day needs a steady supply of combustible waste for two decades or more. A city that succeeds in separating organics and recyclables at source will send less of that material to the plant, while a city that fails will still send the uncovered 644 tonnes to an overloaded landfill. The Bantargebang plant in Jakarta shows the risk: it handles only a small fraction of the city's daily waste and operates

without systematic upstream sorting (Tampubolon et al., 2025). A review of Indonesia's shift from community-based management toward waste-to-energy concludes that plants succeed only when paired with governance, social support, and a steady feedstock supply, and recommends a phased, hybrid model (Iresha et al., 2026). The waste hierarchy places energy recovery below prevention, reuse, and recycling (Pires & Martinho, 2019), and life cycle reviews show that a plant can lower or raise system-wide impacts depending on how it interacts with recycling and landfill operations (Istrate et al., 2020). The Makassar life cycle study points the same way: its best-performing scenario treated incineration as one component alongside composting and landfill gas capture (Muis, Rachman, et al., 2024). Landfill gas recovery at Bantargebang offers a precedent for that kind of combined approach in an Indonesian city (Kurniawan et al., 2022). Because the documented gaps in landfill operation and source separation are large and unresolved, we rate upstream waste management as Weak.

Public legitimacy and the siting question

Public legitimacy remains contested. In March 2023 the South Sulawesi chapter of the environmental organization Walhi rejected waste combustion on substantive grounds, and a member of Commission C of the city council asked the environment agency to review the site then planned in the Tamalanrea–Biringkanaya area. The mayor at the time replied that emissions would meet air quality standards (detikSulsel, 2023). In February 2026 the current mayor and the Coordinating Minister for Food backed siting at Tamangapa, arguing that it would add no cost and that nearby residents could take part in waste management (Metro TV, 2026). A later report nonetheless described the location as still under discussion, in a forum the mayor framed as an open dialogue rather than a contest over who is right (RRI, n.d.-b).

Opposition to waste combustion is common wherever plants are proposed; Maddi (2024) reports that local opposition led to the suspension of a project in Bekasi. The way governments respond shapes the outcome. In the Jiufeng case in Hangzhou, authorities overcame strong local resistance through a set of responses that included information disclosure, benefit sharing, and resident participation (Liu et al., 2019), and the credibility of the environmental impact assessment itself affects how far residents accept a plant (Liu et al., 2021). Evidence from Jakarta is consistent with this. Acceptance rises with residents' knowledge of the technology and their expectation of local economic benefit (Suryawan et al., 2023), and residents show willingness to accept changes when they see firm local policy commitments (Tehupeiory et al., 2023). Collaboration between government and non-governmental organizations can widen participation when it is built into routine decision making (Arantes et al., 2020). Ansell and Gash (2008) add that a history of conflict lowers trust at the start of collaboration and makes sustained face-to-face dialogue more important. Makassar's announced forum is a step in that direction, but the documents do not show what concerns were raised, how they were answered, or whether the answers changed the design. The documents are also silent on informal waste pickers, whose livelihoods depend on access to the waste stream that a plant would absorb (Ferronato & Torretta, 2019; Morais et al., 2022), and who were largely excluded in the Bantargebang case (Tampubolon et al., 2025). We rate public legitimacy as Weak.

Organizational capacity as an evidence gap

None of the eleven documents reports staffing levels, technical competence, or contract management capacity in the city environment agency or the regional enterprises that would deal with the plant. We therefore record this dimension as an evidence gap rather than assign a rating. Other evidence suggests it deserves attention. Bociaga (2026) observes that local government capacity varies widely across Indonesia, so that central rules and large projects

often outpace what local institutions can deliver. Studies of Makassar's land registration program and green open space management both identify shortages of human resources as a constraint on implementation (Nur Asyifa, 2023; Nur Asyifa et al., 2025). Watampone, in the same province, illustrates a related problem: local actors agreed on goals for waste management but lacked the coordinated capacity to act on them (Gafur et al., 2023). Earlier work has linked Makassar's zero-waste ambitions to energy recovery and to sustainable development targets (Saleh et al., 2020), which shows that the policy idea has local currency. Whether the agencies can sustain it through procurement, construction, and two decades of operation is a separate question that documents alone cannot answer.

Institutional readiness profile

Figure 3 consolidates the assessment. Formal institutions, namely the regional agreement and the national coordination around it, form the most developed dimension. The legal basis, financing, and site are developing but unstable. Upstream waste management and public legitimacy are weak, and organizational capacity cannot be judged from the record.

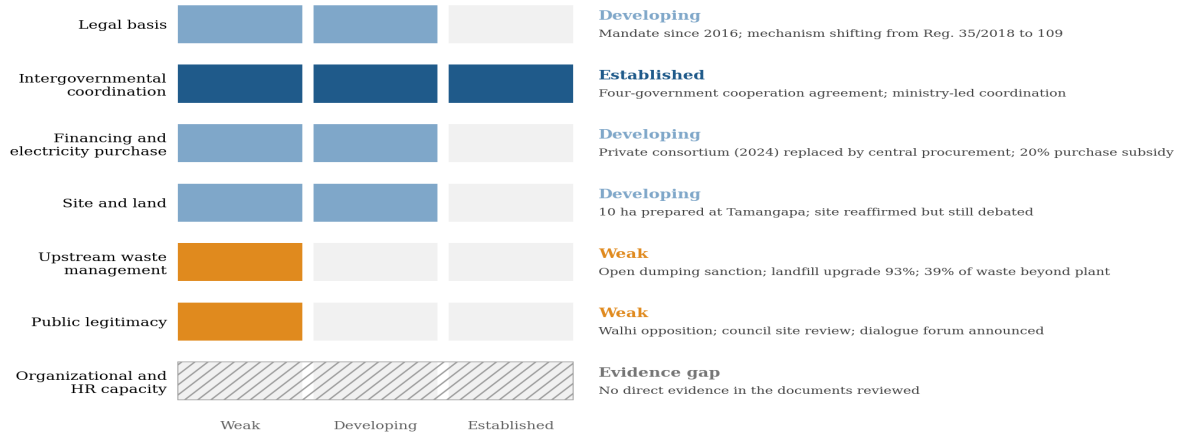


Figure 3. Institutional readiness profile for waste-to-energy in Makassar City

Source: authors' assessment based on the documents analyzed. Bars show the rating level; the hatched bar marks an evidence gap

The profile is consistent with what other studies report. The upstream shortfall mirrors the Indonesian evidence that plant performance depends on feedstock quality and sorting (Iresha et al., 2026; Suryawan et al., 2023; Tampubolon et al., 2025), and the repeated redesign of financing matches the policy and revenue risks identified for public–private projects (Bociaga, 2026; Raharja et al., 2025; Yong et al., 2019). It also echoes findings from other areas of Makassar governance. Collaborative management of green open space worked where roles were clear, policies existed, and the private partner committed funds (Nur Asyifa et al., 2025). The waste-to-energy case satisfies the first two conditions through the national regulation and the regional agreement, but the third has been unstable because the financing has moved from a private consortium toward central procurement and subsidy. Changes in the structure of a waste system carry socio-economic consequences for the actors involved (Tomić & Schneider, 2020), so each redesign reopens questions that the parties thought were closed.

Overall, institutional readiness in Makassar is best described as formal but uneven. Arrangements exist on paper. The project design has been revised repeatedly, the feedstock base depends on upstream reforms that are not finished, and legitimacy has been negotiated rather than settled. International experience suggests that waste-to-energy contributes to sustainable development where it is embedded in an integrated waste management system (Ferraz de Campos et al., 2021), and that choosing among technology options calls for multi-criteria and multi-stakeholder decision support rather than a single engineering criterion

(Vlachokostas et al., 2021). Better waste data would help. Digital monitoring of waste flows has been proposed for Indonesian cities as a way to link collection, recycling, and recovery (Fatimah et al., 2020), and such data would also allow the plant's feedstock assumptions to be tested. The analysis has limits. It rests on documents, official releases and press reports may carry a promotional tone, and several reports are undated. Interviews with agency officials, the project developer, and civil society organizations are needed to test the ratings.

CONCLUSION

This study assessed Makassar City's readiness to govern a waste-to-energy (WtE) plant through documentary analysis structured around seven readiness dimensions. The findings indicate that readiness remains formal but uneven. Regional cooperation agreements and national-level coordination are the most developed elements, whereas upstream waste management and public legitimacy remain weak. Financing arrangements, site selection, and legal mechanisms are also evolving. Between 2024 and 2026, the project shifted from a private consortium involving two proposed sites to a regional plan centred on Tamangapa with central procurement, while the documents indicate that no plant was yet operational. These findings suggest that effective policy readiness depends not merely on the existence of formal instruments but also on their alignment, consistency, and durability. A proposed capacity of 1,000 tonnes per day represents approximately 61% of reported waste generation, highlighting the need to strengthen source separation and landfill management while ensuring that plant capacity reflects realistic waste supply and recycling targets. Stable financing and electricity purchase arrangements are equally important to clarify institutional responsibilities, maintain investor confidence, and prevent repeated project redesign. Furthermore, public legitimacy should be strengthened through transparent consultation, documented responses to concerns about emissions and site selection, credible environmental impact assessments, and meaningful consideration of informal waste workers.

This study is limited by its reliance on documentary evidence, the interpretive nature of the readiness ratings, the presence of undated sources, and the lack of evidence regarding organizational and human resource capacity. Future research should incorporate interviews with government officials, project developers, and civil society organizations, validate the readiness assessments through independent coding, and compare Makassar with other cities participating in the national waste-to-energy program. Such research would provide a more comprehensive understanding of how institutional arrangements, technical capacity, financing stability, and public participation interact to shape policy implementation. Overall, Makassar's waste-to-energy readiness depends on strengthening its weakest institutional dimensions and ensuring that policy commitments, operational capabilities, environmental safeguards, and stakeholder interests develop in a coordinated and sustainable manner.

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AUTHOR CONTRIBUTIONS

MRSO: conceptualization, document search and selection, coding, formal analysis, and writing–original draft. NAT: conceptualization, development of the readiness framework, methodology, validation of ratings, supervision, writing–review and editing, and correspondence. MIA: analysis of waste generation, landfill, and feedstock data, preparation of figures, and writing–review and editing. IA: literature review, data curation, cross-checking

of documentary sources, and writing–review and editing. All authors (MRSO, NAT, MIA, and IA) have read and approved the final version of the manuscript.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to the research, authorship, or publication of this manuscript.

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