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Public–Private Partnerships in Waste Management: Challenges of Transparency and Accountability in Surabaya

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Abstract

Background Increasing waste generation has encouraged the Surabaya City Government to collaborate with the private sector in developing waste-to-energy infrastructure. This study evaluates the public–private partnership between the Surabaya City Government and PT Sumber Organik in managing the Benowo Waste-to-Energy Plant.

Methods This study employed a descriptive qualitative approach. Data were collected through observation, semi-structured interviews, and documentation. Data analysis involved data condensation, data display, and conclusion drawing, while data validity was ensured through source triangulation. The partnership was evaluated based on a public–private partnership evaluation framework.

Results The partnership demonstrated positive operational performance in waste processing and renewable electricity generation, producing 166.1 gigawatt-hours of electricity over nine years. Project continuity was supported by clear role allocation, long-term contractual arrangements, and private-sector technological capacity. However, governance performance remains uneven. Public access to information regarding contractual provisions, financing, performance evaluation, and risk allocation is limited because several project documents are classified as restricted information. This condition weakens transparency, public accountability, and meaningful community participation.

Conclusion The Benowo Waste-to-Energy Plant demonstrates the potential of public–private partnerships to support integrated waste management and renewable energy production. Nevertheless, stronger information disclosure, accountability mechanisms, and public participation are required before this partnership model can be widely replicated in other Indonesian cities.

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Keywords
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Introduction

Indonesia generates approximately 69.9 million tons of waste annually, of which 28.6 million tons consist of food waste. This persistent problem requires greater government attention and innovative management approaches. One such approach is collaboration with the private sector through a Public–Private Partnership (PPP). A PPP is a voluntary collaboration between actors from different sectors who enter into an agreement to achieve shared objectives or address specific needs by sharing risks, responsibilities, and competencies (Manalu & Ma'ruf, 2020). Recent studies indicate that PPPs can strengthen municipal waste-management services by combining government authority with private-sector financing, technology, expertise, and operational capacity (Ngullie et al., 2021).

In Indonesia, cooperation between the government and business entities is regulated by Presidential Regulation No. 38 of 2015 concerning Cooperation Between the Government and Business Entities in Infrastructure Provision. Article 5 stipulates that social and economic infrastructure serving public needs may be developed through PPP arrangements (Anggraeni & Sari, 2020). At the regional level, Government Regulation No. 28 of 2018 concerning Regional Cooperation provides a legal basis for partnerships between local governments and private entities to improve development outcomes and community welfare. Nevertheless, the effectiveness of PPP arrangements is influenced by institutional capacity, regulatory certainty, the allocation of responsibilities, and the ability of public institutions to supervise long-term contractual relationships (Casady et al., 2021).

Table 1. Waste Volume Levels in East Java in 2024

Regency/City	Daily Waste Generation (Tons)	Annual Waste Generation (Tons)
City of Surabaya	1.810,81	660.946,82
Malang Regency	976,00	356.238,93
Sidoarjo Regency	878,60	320.690,10
Banyuwangi Regency	839,10	306.270,96
Jember Regency	835,52	304.964,95

Source: Sistem Informasi Pengelolaan Sampah Nasional (SIPSN) (2024)

Data from the National Waste Management Information System (SIPSN) show that Surabaya was the largest waste generator in East Java in 2024, producing 660,946.82 tons annually. This volume was substantially higher than that of Malang Regency and Sidoarjo Regency, which generated 356,238.93 and 320,690.10 tons, respectively (Tsani et al., 2025). These figures indicate that waste management remains a significant public-service challenge in Surabaya. Similar challenges in other developing contexts demonstrate that limited infrastructure, institutional fragmentation, population growth, and inadequate participation by non-governmental actors can constrain the sustainability of municipal waste-management systems (Gebrekidan et al., 2024).

Table 2. Waste Volume Levels in Surabaya, 2019–2024

Year	Daily Waste Generation (Tons)	Annual Waste Generation (Tons)
2024	1.810,81	660.946,82
2023	1.800,05	657.010,64
2022	1.783,68	651.043,42

2021	1.782,51	650.614,62
2020	2.222,62	811.255,10
2019	2.224,27	811.860,24

Source: Sistem Informasi Pengelolaan Sampah Nasional (SIPSN (2024)

Waste generation in Surabaya declined considerably from 811,255.10 tons in 2020 to 650,614.62 tons in 2021, partly following the operation of the Benowo Waste-to-Energy Plant (PLTSa). However, the volume gradually increased again between 2021 and 2024, alongside population growth from approximately 2.8 million to 3.2 million. In response, the Surabaya City Government has implemented the 4R program—Reuse, Reduce, Recycle, and Replace—and operated the Benowo PLTSa, which can process approximately 1,600 tons of waste per day (Gapura Surabaya, 2025). Within PPP-based waste-management projects, operational sustainability depends not only on technological capacity but also on public support, financial feasibility, institutional coordination, and appropriate risk management (Cao et al., 2022).

The Benowo PLTSa has operated for approximately nine years and has contributed 166.1 gigawatt-hours of energy. Its initial sanitary-landfill facility, which has a generation capacity of 1.65 MW, began operating on November 30, 2015. Following Presidential Regulation No. 35 of 2018 concerning the Acceleration of Waste-to-Energy Development, a second facility using gasification technology, with a capacity of 9 MW, commenced operations on March 10, 2021 (Habibah, 2025).

The project is managed through a 20-year Build–Operate–Transfer agreement between the Surabaya City Government and PT Sumber Organik, effective from October 2012. It generates 2 MW of electricity from landfill gas and 9 MW through gasification (Sumber Organik, 2023). By 2024, the Benowo Landfill had managed approximately 652,816 tons, or 90.06% of Surabaya's waste. It is also recognized as Indonesia's first and largest operational facility for converting waste into electricity (Yayasan Bina Bhaksi Lingkungan, 2023). Its scale and operational continuity make the Benowo PLTSa an important case for evaluating PPP implementation in waste management. Waste-to-energy PPP projects are particularly relevant for such evaluation because their long concession periods and complex contractual structures generate technical, environmental, financial, political, and operational risks that must be distributed appropriately between the government and private partner (Gad et al., 2024).

Previous studies have examined PPP implementation in waste-to-energy and other waste-management projects. Ngullie et al. (2021) found that clearly defined responsibilities, appropriate risk allocation, political support, transparent procurement, and strong stakeholder participation constitute critical success factors in PPP-based municipal solid-waste projects. Pradana et al. (2020), in their study of the Jatibarang Landfill in Semarang, found that the partnership performed successfully in terms of supervision, transparency, commitment, balanced processes, and negotiation. Azzahra et al. (2024) identified significant early-stage challenges and unequal risk allocation at the Putri Cempo Landfill in Surakarta, although the project demonstrated positive performance in transparency, accountability, participation, and stakeholder engagement.

Cao et al. (2022) demonstrated that PPP waste-to-energy projects face interconnected risks arising from lengthy concession periods, complex contractual relationships, government

decision-making, public opposition, and uncertainty regarding waste supply and project revenue. Similarly, Gad et al. (2024) identified technological, financial, environmental, contractual, land-availability, and operational risks as important determinants of waste-to-energy PPP sustainability. Tahir et al. (2024) further showed that the technological configuration and contractual model adopted in operational energy-from-waste projects influence the distribution and management of risks between public and private actors. Raharja et al. (2025) also found that revenue uncertainty, government creditworthiness, technical complexity, environmental impacts, and public opposition are among the principal risks affecting PPP-based waste-to-energy projects. Meanwhile, Hasit and As'ari (2021) found that a waste-management partnership in Pekanbaru had not operated optimally, despite the government's commitment to continuing and improving the program.

Other studies have primarily focused on relationships and coordination among partnership actors, stakeholder satisfaction, partnership mechanisms, and the transition toward a circular economy. Hasit and As'ari (2021) emphasize relationships and coordination among partnership actors, whereas Aning-Agyei et al. (2024) examine public satisfaction with waste-management partnerships. Alhosani (2025) and Spoann et al. (2019), meanwhile, focus on the role of partnerships in supporting the transition toward a circular economy. Although these studies provide important insights, limited attention has been given to evaluating PPP implementation after a project has entered the operational and monitoring phases.

More specifically, previous research has not sufficiently examined how transparency and accountability are maintained during long-term PPP operations, including the disclosure of information, clarity of institutional responsibilities, contractual oversight, and public access to performance evaluation. Transparency may become increasingly difficult during the operational phase because governments must balance public access to contractual and performance information against the protection of commercially sensitive information held by private partners (Sheppard, 2023).

This study addresses that gap by evaluating the PPP process at the Benowo PLTSa from project initiation to the operational and monitoring phases. Unlike previous studies that primarily examine partnership formation, actor coordination, or project outcomes, this study specifically highlights transparency and accountability as central governance challenges in sustaining an operational PPP. Its contribution lies in explaining how contractual arrangements, institutional roles, information disclosure, and oversight mechanisms influence the accountability of both government and private actors throughout the implementation of a long-term waste-management partnership.

The analysis employs the PPP framework proposed by Matos and Gonçalves (2020), which covers contractual provisions, regulatory and legislative aspects, organizational factors, early-stage project analysis, stakeholder participation and engagement, risk allocation, budget feasibility, and oversight systems. This framework is relevant because it enables the partnership to be assessed not only in terms of technical performance and electricity generation but also through the institutional mechanisms that determine transparency, the allocation of responsibilities, and accountability during project implementation. It therefore provides an appropriate analytical basis for identifying the factors that support or constrain the Benowo PLTSa partnership throughout its operational and monitoring phases. Recent PPP research further indicates that transparency must be maintained throughout

procurement, contract implementation, performance reporting, supervision, and evaluation to ensure that long-term partnerships remain accountable to the public (Reig & Miles, 2021).

Accordingly, this study aims to evaluate the implementation of the Public–Private Partnership at the Benowo Waste-to-Energy Plant from its initiation to its operational and monitoring phases, with particular attention to transparency, accountability, and the factors enabling or constraining the partnership.

Methods

This study employed a qualitative descriptive approach to obtain an in-depth understanding of the implementation of the Public–Private Partnership (PPP) at the Benowo Waste-to-Energy Plant (PLTSa). Qualitative research examines phenomena in their natural setting without manipulating the conditions being studied (Sugiyono, 2023). The research was conducted at the Benowo Landfill, PT Sumber Organik, and the Surabaya City Environmental Agency. Informants were selected purposively based on their knowledge, responsibilities, and direct involvement in the planning, implementation, operation, or supervision of the partnership. They included representatives of the Surabaya City Environmental Agency, the management and operational personnel of PT Sumber Organik, and other stakeholders with relevant knowledge of the Benowo PLTSa partnership.

Data were collected through direct observation, semi-structured interviews, and documentation. Observations focused on the operational activities of the Benowo PLTSa, interactions between the government and the private partner, waste-processing procedures, and monitoring practices. Semi-structured interviews were conducted using an interview guide while allowing informants to elaborate on contractual arrangements, institutional responsibilities, stakeholder participation, risk allocation, budget feasibility, transparency, accountability, and oversight mechanisms. Documentary data were obtained from partnership agreements, laws and regulations, institutional reports, performance records, government publications, and other relevant secondary sources. Data collection continued until the information obtained was considered sufficient to explain the implementation of the partnership and no substantially new themes emerged.

Data were analyzed interactively using the stages proposed by Miles et al. (2020), comprising data condensation, data display, and conclusion drawing and verification. Interview transcripts, observation notes, and documents were coded and classified according to the PPP framework of Matos and Gonçalves (2020), covering contractual provisions, regulatory and legislative aspects, organizational factors, early-stage project analysis, stakeholder participation and engagement, risk allocation, budget feasibility, and oversight systems. These dimensions were used to identify the factors supporting or constraining transparency and accountability throughout the initiation, operational, and monitoring phases of the partnership. Data credibility was established through source and method triangulation by comparing information obtained from government representatives, private-sector actors, observations, interviews, and documentary evidence. Any inconsistencies were re-examined across the available sources before the findings and conclusions were finalized.

Results and Discussion

The Benowo Waste-to-Energy Plant (PLTSa) was developed through a Public–Private Partnership (PPP) between the Surabaya City Government and PT Sumber Organik. This

partnership emerged in response to increasing waste generation in Surabaya and the limited capacity of conventional waste-management systems. The private sector was involved to process municipal waste into electricity while supporting the continuity of public waste-management services. Drawing on the PPP evaluation framework proposed by Matos and Gonçalves (2020), this study assesses the partnership through interconnected contractual, regulatory, organizational, financial, participatory, transparency, and monitoring dimensions.

Contractual and Regulatory Framework

The findings indicate that the contractual framework has provided a relatively strong foundation for the implementation of the Benowo PLTSa partnership. The cooperation is based on Agreement No. 658.1/4347/436.6.5/2012 and No. 88/JBU-SO/8/2012, dated August 8, 2012, concerning the provision of infrastructure and facilities at the Benowo Final Waste Processing Site. The agreement defines the objectives, rights, obligations, operational targets, sanctions, and responsibilities of the parties. Clearly defined contractual responsibilities are essential in long-term PPP projects because they reduce uncertainty, prevent overlapping authority, and provide a basis for evaluating partner performance (Matos & Gonçalves, 2020; Ngullie et al., 2021).

Under the agreement, the Surabaya City Government is required to deliver 1,000 tons of waste per day and pay the corresponding tipping fee. PT Sumber Organik is responsible for processing the waste, operating the facility, and generating electricity for sale to PT PLN. If the local government delivers less than the agreed volume, it must still pay a tipping fee equivalent to 1,000 tons. Conversely, the construction and operational activities of PT Sumber Organik are subject to government supervision. During approximately 13 years of implementation, neither party reportedly committed violations warranting contractual penalties. This indicates that both parties have generally fulfilled their principal contractual obligations.

The contract has also demonstrated adaptability through an amendment made in 2015 following changes in central government policy. Such flexibility is important because long-term PPP projects must respond to regulatory, technological, financial, and operational developments without abandoning their original public-service objectives (Matos & Gonçalves, 2020). The selection of PT Sumber Organik was conducted through a competitive bidding process involving three companies. The proposals were assessed based on financial, technological, environmental, economic, and social considerations. Negotiations also addressed technology selection, waste-weighing procedures, supervision, landfill operations, and environmental permits.

From a regulatory perspective, the partnership was initiated when Indonesia did not yet have a comprehensive regulation specifically governing PPP-based waste-to-energy projects. The Surabaya City Government therefore initially relied on Law No. 18 of 2008 concerning Waste Management. More detailed procedures were subsequently introduced through Regulation of the Minister of National Development Planning/Head of Bappenas No. 2 of 2020 concerning PPP implementation in infrastructure provision. Although the project preceded this regulation, its planning, preparation, transaction, and implementation stages were generally consistent with the current PPP framework.

Legal and administrative supervision has involved several institutions, including the District

Attorney's Office, the Ministry of Environment, the Ministry of Public Works and Housing, and the Surabaya City Environmental Agency. The tipping fee is financed through the Surabaya City Regional Budget and approved by the Surabaya City Council, providing a formal mechanism for legislative oversight of public expenditure.

Nevertheless, regulatory compliance has not been fully accompanied by public access to contractual and environmental information. The complete cooperation agreement and Environmental Impact Assessment are not widely accessible. This limits the ability of external stakeholders to assess performance targets, environmental obligations, risk allocation, and compliance by both parties. Transparency in PPP contracts is necessary to ensure that the protection of commercially sensitive information does not reduce public accountability (Reig & Miles, 2021; Sheppard, 2023). Thus, contractual clarity and administrative compliance have performed relatively well, while public disclosure and substantive environmental accountability remain challenges.

Project Planning and Organizational Arrangements

The early-stage planning of the Benowo PLTSa project involved competitive bidding, technical evaluation, environmental assessment, and negotiations between the local government and prospective private operators. PT Sumber Organik's proposal was assessed and refined with support from a team of experts appointed by the Surabaya City Government. The assessment covered technological, financial, environmental, economic, and social considerations. Such comprehensive preliminary analysis is particularly important in waste-to-energy projects because technological, environmental, financial, political, and contractual risks are closely interconnected (Cao et al., 2022; Raharja et al., 2025).

The initial agreement required the Surabaya City Government to deliver at least 1,000 tons of waste per day. In practice, approximately 1,600 tons of waste enter the Benowo Landfill daily. This condition shows that the facility operates above the minimum contractual supply target and continues to respond to Surabaya's waste-management needs. However, the increased waste volume also requires periodic evaluation of the facility's technical capacity and environmental impacts.

Financial planning established a tipping fee of Rp200,000 per ton. Monthly payments are calculated using waste-weighing data verified by PT Surveyor Indonesia as an independent party. Third-party verification helps reduce disagreements regarding the amount of waste processed and the payments that must be made by the government. It also strengthens the reliability of operational data used as the basis for financial transactions.

Environmental considerations were included through the preparation of an Environmental Impact Assessment by PT Sumber Organik, supported by consultants and relevant government institutions. However, an initial environmental assessment cannot replace continuous evaluation during the operational stage. Concerns raised by WALHI East Java regarding air quality around the facility demonstrate the importance of periodically reviewing the assumptions and mitigation measures contained in the environmental assessment. These concerns should be examined through transparent monitoring and independent verification rather than relying solely on statements from either the operator or civil society.

Organizationally, the partnership has a relatively clear division of responsibilities. The

Surabaya City Environmental Agency represents the local government in supervising waste-management services, while PT Sumber Organik manages the daily operation of the landfill and power plant. The local government facilitates permits, ensures waste delivery, pays the tipping fee, and conducts supervision. Meanwhile, the private partner is responsible for processing waste, maintaining equipment, operating the facility, and generating electricity. Clearly allocated institutional roles are important because ambiguous authority can create coordination problems and weaken accountability in PPP implementation (Casady et al., 2021).

Human-resource development also supports the partnership. Approximately 70% of operational employees are recruited from surrounding communities, while workers with specialized expertise are assigned to technical operations. PT Sumber Organik provides training according to employees' duties and competency requirements. Local recruitment creates employment opportunities and may strengthen community acceptance, while technical training contributes to operational reliability and workplace safety.

Coordination between the government and private partner is conducted through monthly evaluations of waste-weighing data, environmental reports, and operational issues. Additional meetings are held when specific problems require immediate action. These arrangements demonstrate that planning and organizational coordination have generally supported project continuity. Nevertheless, the results of coordination meetings, corrective actions, and follow-up measures should be documented and disclosed periodically to improve institutional accountability.

Risk Allocation and Financial Sustainability

The partnership distributes operational, technical, financial, and regulatory risks between the Surabaya City Government and PT Sumber Organik. The private partner bears most technical and operational risks because it is responsible for constructing, maintaining, and operating the facility. The local government remains responsible for ensuring waste supply, paying the tipping fee, facilitating permits, and addressing impacts that require public intervention. This arrangement is consistent with the principle that PPP risks should be allocated to the party most capable of controlling, mitigating, or absorbing them (Matos & Gonçalves, 2020; Rasheed et al., 2022).

Financial risks are shared through private investment, tipping-fee payments, and electricity-sale revenue. PT Sumber Organik invested approximately Rp362 billion in the sanitary-landfill power plant and Rp704.4 billion in the gasification facility. This private investment red9uces the need for the local government to finance the entire infrastructure cost directly. Meanwhile, the government provides a degree of revenue certainty through the tipping fee, while PT Sumber Organik receives additional revenue from electricity sales to PT PLN.

The facility reportedly generates approximately 12 MW of electricity. Of this amount, around 9 MW is sold to PT PLN, 2 MW is used for plant operations, and 1 MW is maintained as a reserve. PT Sumber Organik also pays an annual land-lease fee of approximately Rp3 billion to the Surabaya City Government. These financial arrangements have supported the continuity of the facility despite its substantial investment and operating costs.

The consistent allocation and payment of the tipping fee through the Regional Budget indicate that budget compliance has generally functioned effectively. However, the

availability of budget allocations does not automatically demonstrate financial efficiency or value for money. Long-term PPP projects may create fiscal risks when payment obligations, changes in operational costs, revenue projections, and contingent liabilities are not evaluated transparently. Financial sustainability therefore requires continuous monitoring, reliable feasibility analysis, proportional risk allocation, and accessible fiscal reporting (Akomea-Frimpong et al., 2024).

Detailed information concerning the calculation of the tipping fee, operational expenditure, electricity-sale revenue, and the overall financial performance of the partnership remains limited. Similarly, the complete distribution of operational, financial, environmental, and regulatory risks is not publicly available. Consequently, external stakeholders cannot fully determine whether risks and financial benefits have been distributed proportionately.

The risk-sharing and financial arrangements have succeeded in supporting operational continuity, but public reporting must be strengthened. The government should publish periodic financial summaries and non-confidential risk-allocation information so that the public can assess whether the costs incurred are proportional to the waste-management services, electricity output, and environmental benefits produced by the project.

Stakeholder Participation, Transparency, and Accountability

Stakeholder participation has occurred during the construction and operational stages, particularly among communities living around the Benowo Landfill. However, community involvement was relatively limited during the initial planning stage. Protests emerged because residents believed that their interests and concerns had not been adequately accommodated before project implementation. Following these protests, surrounding communities became more involved in environmental-document preparation, construction activities, employment, and certain operational processes.

The subsequent involvement of local communities demonstrates the project's capacity to respond to social demands. Nevertheless, effective participation should begin before major decisions are finalized. Early involvement allows affected communities to communicate local knowledge, identify potential risks, and contribute to the formulation of mitigation measures. Stakeholder participation and public support are recognized as critical factors affecting the legitimacy and sustainability of PPP-based solid-waste-management projects (Ngullie et al., 2021; Aning-Agyei et al., 2024).

Participation by civil society organizations and the wider public remains limited. WALHI East Java sought access to environmental documents and conducted air-quality monitoring around the facility. Its findings differed from the statements of the government and operator, which maintained that emissions were monitored in accordance with applicable requirements. These differences reinforce the importance of independent verification and transparent publication of monitoring methods, measurement periods, sampling locations, laboratory results, and corrective actions.

Transparency remains one of the principal weaknesses of the partnership. The cooperation agreement, detailed financial arrangements, environmental-monitoring data, performance reports, and risk-allocation information are not routinely available to the public. PT Sumber Organik considers the facility a restricted area because of safety concerns and the high economic value of its assets. Although physical access restrictions may be justified, they

should not limit access to information concerning public expenditure, environmental effects, and service performance.

The Surabaya City Government also does not yet provide a dedicated public-information platform for the Benowo PLTSa partnership. Available information is generally limited to basic project descriptions, waste volumes, electricity generation, and occasional statements published through government or media channels. This prevents the public from consistently comparing performance across different periods.

PPP governance requires a balance between internal confidentiality and external transparency. Commercially sensitive information may be protected, but information concerning public interest, environmental performance, public expenditure, and service outcomes should remain accessible (Reig & Miles, 2021; Sheppard, 2023). Minimum disclosure should therefore include a non-confidential contract summary, annual performance reports, tipping-fee expenditure, electricity production, environmental-monitoring results, public complaints, and actions taken to address non-compliance.

Stakeholder participation has therefore been stronger among communities directly surrounding the facility than among civil society organizations and the wider public. The partnership requires more formal and inclusive participation mechanisms, including periodic public consultations, accessible complaint channels, environmental-information forums, and digital publication of monitoring results. Participation should not end once the project is accepted but should continue throughout its operation and evaluation.

Monitoring and Overall Partnership Performance

The monitoring system involves the Surabaya City Government, PT Sumber Organik, technical units within the facility, and PT Surveyor Indonesia as an independent verifier of waste-weighing data. During construction, monitoring was conducted by the city government, the Ministry of Environment, and a team of experts to assess compliance with contractual and technical requirements. During the operational phase, PT Sumber Organik conducts internal technical and safety controls, while the Surabaya City Environmental Agency supervises waste management, sanitation, and environmental performance.

Monitoring activities include monthly leachate reports, quarterly monitoring-well reports, and air-quality reports every six months. Additional coordination is undertaken when critical operational or environmental issues require immediate attention. Scheduled reporting and third-party verification indicate that the partnership has established a functioning internal monitoring structure.

These mechanisms reduce information asymmetry between the government and private partner and provide a basis for evaluating operational performance. Effective monitoring is essential because public and private actors may have different technical capacities, interests, and access to information. Strong institutional arrangements can improve risk identification and performance control throughout the PPP life cycle (Yang et al., 2024).

However, the results of monitoring are not consistently accessible to external stakeholders. Consequently, the monitoring system functions primarily as an internal compliance mechanism rather than a broader instrument of public accountability. Independent environmental audits, publication of monitoring results, complaint follow-up, and disclosure of corrective actions are necessary to strengthen its credibility.

Overall, the findings show that the Benowo PLTSa partnership has performed relatively well in contractual clarity, early-stage project analysis, organizational arrangements, risk-sharing mechanisms, budget compliance, and internal monitoring. Its continuity is supported by a clear division of responsibilities, contractual flexibility, substantial private investment, consistent tipping-fee payments, independent verification of waste volumes, employee training, and routine operational reporting. These conditions have enabled the facility to process large amounts of waste and generate electricity over an extended period.

In contrast, stakeholder participation, transparency, environmental accountability, public information access, and external oversight remain significant challenges. Limited access to contracts, environmental documents, financial information, risk-allocation arrangements, and monitoring reports restricts independent evaluation of whether the partnership consistently protects the public interest. Therefore, the central challenge is not merely maintaining technical operations but ensuring that operational achievements are accompanied by transparent and accountable governance.

Strengthening the partnership requires the publication of non-confidential contractual and financial information, independent environmental monitoring, accessible reporting platforms, inclusive public consultation, and periodic evaluation of value for money and risk allocation. These improvements would allow the Benowo PLTSa partnership to maintain its operational performance while increasing public legitimacy, environmental accountability, and long-term sustainability.

Conclusion

This study concludes that the Public–Private Partnership in the Benowo Waste-to-Energy Plant has performed relatively well in terms of contractual clarity, regulatory and administrative compliance, project planning, organizational arrangements, risk sharing, budget compliance, and internal monitoring. A clear division of responsibilities, contractual flexibility, substantial private investment, consistent tipping-fee payments, third-party verification, and routine operational monitoring have supported the continuity of waste processing and electricity generation. However, stakeholder participation, information disclosure, environmental accountability, and external oversight remain significant challenges. Limited public access to contractual documents, financial information, environmental reports, risk-allocation arrangements, and monitoring results restricts independent evaluation of the partnership's performance and public value.

The study contributes to the PPP literature by demonstrating that contractual, financial, and operational continuity does not necessarily indicate comprehensive governance success. In waste-to-energy partnerships, effective performance must also be assessed through public participation, transparency, environmental accountability, and the accessibility of monitoring results. The findings therefore extend PPP evaluation beyond formal compliance and operational achievement by emphasizing the importance of balancing partnership continuity with the protection of the public interest. The study also shows that these governance dimensions are interconnected: limited transparency weakens stakeholder participation, while restricted public access to monitoring information reduces environmental and financial accountability.

This research has several limitations. It focuses on a single PPP project, so the findings cannot

be generalized to all waste-to-energy partnerships in Indonesia. Access to complete contractual, financial, environmental, and risk-allocation documents was also limited. In addition, the study did not directly measure value for money, long-term fiscal risks, emissions, or the social and health impacts experienced by communities surrounding the facility. Future research should compare waste-to-energy PPP projects across different regions, examine changes in partnership performance over time, and incorporate the perspectives of affected communities and civil society organizations more extensively. Further studies should also assess value for money, environmental outcomes, health impacts, and long-term fiscal liabilities using mixed methods and independently verified data. Such research would provide a more comprehensive understanding of whether waste-to-energy PPPs are operationally sustainable, environmentally responsible, and accountable to the public.

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