



Urban Waste Governance in Jakarta: Assessing Institutional Challenges and Policy Implementation

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Abstract

Waste management failure in Jakarta is not merely a technical or environmental issue; rather, it reflects fundamental deficiencies in the regulatory framework, which has failed to generate efficient economic incentives, internalize environmental externalities, and operationalize circular economy mechanisms. Employing a socio-legal research methodology combined with a normative-economic approach, this study finds that Indonesia's waste management regime remains predominantly governed by a command-and-control model, which has proven ineffective in influencing the economic behaviour of producers, consumers, and local governments. Structural deficiencies—including the absence of a robust Extended Producer Responsibility (EPR) framework, excessive transaction costs arising from institutional fragmentation, the inability of existing pricing structures to reflect the marginal cost of waste disposal, and the systematic exclusion of the informal waste sector—have collectively produced a governance architecture that is economically inefficient and socially inequitable. This study aims to identify and analyse the role of Economic Analysis of Law (EAL) in enhancing the efficiency and effectiveness of waste management legislation in Jakarta and to formulate an appropriate regulatory model for urban waste governance. The findings demonstrate that EAL provides a robust analytical framework for diagnosing regulatory failures and evaluating institutional inefficiencies. The study argues that reconstructing Indonesia's waste management regulatory framework requires a transition from a predominantly punitive command-and-control approach to a comprehensive incentive-compatible regulatory system. Such reform carries significant implications for legislative development and supports the realization of the constitutional right to a good and healthy environment as guaranteed under Article 28H of the 1945 Constitution of the Republic of Indonesia. Accordingly, the proposed regulatory model should adapt international best practices to Indonesia's institutional context, thereby aligning economic incentives with environmental sustainability and social inclusion.

Keywords: Circular Economy; Economic Analysis of Law; Environmental Justice; Environmental Regulation; Regulatory Efficiency.

A. Introduction

Jakarta's waste governance crisis is a predictable consequence of regulatory design failure. More specifically, it reflects the inability of the existing regulatory framework to create efficient economic incentives, internalise the social costs of environmental externalities, and institutionalise circular economy mechanisms within the legal system. Addressing these deficiencies requires more than incremental policy adjustments; it demands a fundamental reconceptualisation of the legal architecture governing waste management by shifting from punitive and bureaucratic regulation toward an incentive-compatible, market-oriented, and digitally enabled governance framework.

Waste management in Jakarta has reached a critical stage, posing significant environmental, social, and governance challenges. These conditions underscore the urgent need for regulatory and institutional reforms, supported by an integrated waste management

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and source-separation system. Current data indicate that approximately two-thirds of organic waste—equivalent to more than one hundred thousand tonnes per day—is not managed properly, while only around one-quarter is disposed of in landfill facilities (TPS).

The inadequacy of Jakarta's waste management infrastructure is not a recent phenomenon. The operational burden on the Bantar Gebang Integrated Waste Processing Site (*Tempat Pengolahan Sampah Terpadu*—TPST), which receives more than 7,000 tonnes of waste each day and has long operated beyond its designed capacity, illustrates the structural unsustainability of Indonesia's long-standing linear waste economy (Al-Hamasy, 2026). Although Law No. 18 of 2008 on Waste Management (hereinafter referred to as the Waste Management Law) requires the closure of all open dumping sites within five years of its enactment and their replacement with environmentally sound sanitary landfill systems, implementation has remained inadequate. More recently, the Government has committed to closing open dumping sites within the next two years, prioritising 24 of the 40 cities identified as requiring urgent intervention.

Previous studies have highlighted several important dimensions of waste management. The development of waste processing technologies over the past five decades has contributed positively to environmental protection, although their overall efficiency remains limited. Likewise, the implementation of circular economy initiatives, particularly through partnerships with the informal waste sector, has supported the achievement of the Sustainable Development Goals (SDGs) by increasing community income and contributing to poverty reduction. Nevertheless, waste processing technologies continue to face a trade-off between environmental effectiveness and economic efficiency because of their high investment and operational costs. Consequently, the literature suggests that a sustainable economic approach aimed at reducing waste generation at its source represents a more rational and effective long-term strategy (Maalouf & Agamuthu, 2023).

Teguh Yuwono and Retna Hanani, argue that waste management regulations in Yogyakarta have contributed to more effective and consistent waste governance within a decentralised administrative system. This achievement is attributed to the alignment and harmonisation of provincial and municipal policies, active stakeholder participation, and integrated institutional coordination, as reflected in regional planning instruments—such as the Regional Development Work Plan Evaluation Team—and environmental technical regulations (Yuwono & Hanani, 2025).

Similarly, Harfadli et al., evaluated waste management systems across Indonesian cities and found a persistent mismatch between formal regulatory mandates and actual implementation. Their study identifies inadequate institutional capacity, limited resource allocation, and the absence of legal recognition for informal waste actors as the principal factors undermining regulatory effectiveness, thereby demonstrating that the central challenge is institutional rather than merely technical (Harfadli et al., 2025).

Listiningrum et al., further argue that the lack of clearly defined institutional responsibilities for waste management has undermined the protection of public interests and welfare, partly because of insufficient budgetary allocations. They therefore recommend regulatory harmonisation, a clearer division of authority between the central and regional governments, the establishment of an independent Regional Public Service Agency (*Badan Layanan Umum Daerah*—BLUD) dedicated to service-based waste management, and the optimisation of waste governance based on circular economy principles (Listiningrum et al., 2023).

These findings collectively demonstrate that Indonesia's waste governance challenges extend beyond operational deficiencies and reflect deeper structural weaknesses in the regulatory framework. Such regulatory failures generate significant economic costs because environmental degradation arising from inadequate waste management creates negative externalities that existing legal institutions have been unable to internalise effectively.

Kurniawan et al., report that, in Jakarta, more than 35 per cent of the municipal budget has been allocated to solid waste management, of which nearly 90 per cent is spent on waste collection activities. Despite this substantial expenditure, approximately 40 per cent of waste remains uncollected, while only about half of the urban population is served by the formal waste collection system. This substantial allocative inefficiency indicates that Jakarta's waste governance crisis is fundamentally a matter of regulatory and institutional reform rather than merely one of technical improvement (Kurniawan et al., 2021).

Comparable findings have also been reported in Bali, where Runtukahu et al., demonstrate that effective waste management, particularly for plastic waste, depends on innovation in sustainable waste governance through a community-based circular economy approach. Their study highlights that integrating community participation with circular economy principles contributes not only to environmental conservation but also to the sustainable development of the tourism sector (Runtukahu et al., 2025).

Research gap existing scholarship on waste management in Indonesia has predominantly focused on technical engineering solutions, logistical optimisation, and public administration perspectives. Although these studies have made valuable scholarly contributions, they reveal a significant analytical gap: the absence of a systematic legal-economic analysis of the regulatory framework governing waste management. In particular, previous research has not adequately examined how environmental externalities, transaction costs, and distorted incentive structures contribute to persistent governance failures. Likewise, the regulatory framework has rarely been analysed through the lens of Economic Analysis of Law (EAL), nor have circular economy principles been systematically employed to formulate normative regulatory reforms grounded in empirical evidence.

Novelty this article offers three principal scholarly contributions. First, it applies the Economic Analysis of Law (EAL) framework—drawing on the foundational works of Richard Posner, Ronald Coase, and Guido Calabresi—to the governance of municipal solid waste in a developing-country context. In doing so, it integrates normative legal analysis with empirical evidence obtained through field research conducted in Jakarta, Bali, and other major urban centres. Second, the article combines environmental governance theory with political economy analysis to explain how regulatory capture and rent-seeking practices distort the procurement and delivery of waste management services. Third, it proposes a normative reconstruction of Indonesia's environmental law framework by operationalising circular economy principles and smart governance instruments as legally enforceable regulatory standards.

Research objective this study aims to identify and analyse the role of Economic Analysis of Law (EAL) in enhancing the efficiency and effectiveness of waste management legislation in Jakarta and to examine an appropriate regulatory model for improving urban waste governance.

B. Research Methodology

This study employs a juridical-empirical research method, which combines normative legal research with a socio-legal approach to evaluate the performance and structural characteristics of Indonesia's waste management regulatory framework (Prasetyo & Narutomo, 2025). The normative dimension examines the internal coherence, constitutional validity, and economic rationality of the applicable legal framework, whereas the empirical dimension contextualises the legal analysis by examining documented governance outcomes, waste management data, and the political-economic dynamics influencing regulatory implementation.

The study adopts a statutory approach, involving a systematic analysis of Law No. 18 of 2008 on Waste Management, Government Regulation No. 81 of 2012, DKI Jakarta Governor Regulation No. 77 of 2020, and other relevant implementing regulations. Primary legal materials also include official government reports, policy documents, and audit reports. Secondary legal materials comprise peer-reviewed articles published in internationally indexed journals, reports issued by the World Bank, the Organisation for Economic Co-operation and Development (OECD), and the United Nations Environment Programme (UNEP), as well as field-based studies conducted in major Indonesian cities.

To enhance the validity and reliability of the findings, the study employs data triangulation by comparing and cross-validating evidence derived from multiple legal and empirical sources.

C. Results and Discussion

Posner, as cited in Fauzi and Purnamawati, argues that Economic Analysis of Law (EAL) approaches legal problems by applying economic principles to evaluate and resolve legal issues (Fauzi & Purnamawati, 2020). From this perspective, the principal criterion for assessing any legal rule is economic efficiency—that is, whether the rule allocates resources to their highest-valued use while minimising social costs and resource waste. In the context of environmental regulation, Roy explains that the primary economic objective of environmental law is to ensure that pollution externalities are internalised by providing decision-makers with incentives to bear the full social costs of their activities (Listiningrum et al., 2023). Applied to waste management, this principle requires waste generators to face price signals that accurately reflect the marginal social cost of waste generation, thereby encouraging more efficient and environmentally responsible behaviour.

Ronald Coase, in *The Problem of Social Cost* (1960), demonstrated that, in the absence of transaction costs, voluntary bargaining between parties can achieve economically efficient outcomes regardless of the initial allocation of legal rights. As discussed by Okreshidze, Coase's proposition suggests that when transaction costs are low and property rights are clearly defined, parties are able to negotiate efficient solutions to conflicts arising from environmental externalities. However, these conditions rarely exist in practice, particularly in complex environmental governance systems where transaction costs are substantial and institutional arrangements remain fragmented.

Under conditions of high transaction costs, the design of legal rules becomes the decisive factor in achieving efficient outcomes. Community-based education in waste management has been shown to increase environmental awareness, encourage public participation, and reduce waste accumulation, while simultaneously creating opportunities

for local economic development (Nurhayati & Nurhayati, 2023). Nevertheless, the absence of an effective regulatory framework does not produce a welfare-neutral equilibrium. Instead, it generates regressive outcomes in which economically vulnerable communities bear a disproportionate share of environmental costs, consistent with the predictions of Economic Analysis of Law when transaction costs are high and bargaining power is unevenly distributed.

The principle of allocating responsibility to the cheapest cost avoider, developed within the Economic Analysis of Law tradition by Guido Calabresi and subsequently applied in environmental governance, provides an important theoretical foundation for waste regulation. In this context, Jiang and Zhang argue that producers are generally the cheapest cost avoiders throughout the product life cycle and therefore should bear responsibility for managing post-consumer waste through Extended Producer Responsibility (EPR) mechanisms. Their study further demonstrates that well-designed EPR systems encourage green innovation and reduce recycling costs by aligning economic incentives with environmental objectives (Jiang & Zhang, 2023).

The internalisation of negative environmental externalities through economic policy instruments constitutes a mechanism for ensuring that the social costs of environmental degradation are borne by those responsible for generating them. Internalisation requires decision-makers to incorporate the costs associated with environmental impacts into their economic calculations through appropriate policy instruments, including regulatory measures, economic incentives, and institutional mechanisms. Noordwijk et al., further emphasise that the effective internalisation of environmental externalities requires social inclusion, stakeholder participation, and transparent accounting systems capable of recognising environmental costs within organisational decision-making processes (Van Noordwijk et al., 2023).

An environmental externality refers to the adverse effects of an economic activity on the welfare of individuals or communities who are not directly involved in that activity. Such externalities can be expressed in monetary terms to facilitate compensation mechanisms and to prevent the inefficient allocation of economic resources. As explained by Tanan et al., externalities arise whenever the actions of one individual or organisation affect the welfare of others without those effects being reflected in market prices (Tanan et al., 2021).

The internalisation of environmental externalities also requires collaborative governance involving multiple stakeholders. Putra and Raharjo, argue that Corporate Social Responsibility (CSR) initiatives become more effective when implemented through the Pentahelix model, which integrates the participation of Academia, Business, Community, Government, and Media (ABCGM). Within this framework, academic institutions contribute through research and technological innovation in waste management; businesses promote sustainable production through CSR, Environmental, Social, and Governance (ESG) initiatives, and Extended Producer Responsibility (EPR) schemes; communities support waste segregation, waste banks, and recycling activities that strengthen the circular economy; governments establish regulatory and institutional frameworks; while the media facilitates public communication, environmental education, and awareness campaigns (Eko Putra & Raharjo, 2023).

The circular economy (CE), as conceptualised by Espuny et al., represents a regenerative economic system in which the value of products, materials, and resources is maintained for as long as possible through strategies of reduction, reuse, recycling, and recovery (Espuny et

al., 2022). Consistent with this perspective, Tri Utomo et al., argue that affordable and measurable waste management in Depok City can be achieved through an inclusive, community-based circular economy model integrated into a broader governance system. Their study further demonstrates that institutional strengthening and climate-oriented financing can support the achievement of Sustainable Development Goal (SDG) 12 on responsible consumption and production (Tri Utomo et al., 2025).

The global waste crisis represents one of the most significant governance challenges of the twenty-first century. According to the World Bank's What a Waste 2.0 report, approximately 2.01 billion tonnes of municipal solid waste are generated worldwide each year, and this figure is projected to increase to 3.40 billion tonnes by 2050 as a consequence of rapid urbanisation and population growth, particularly in low-and middle-income countries (Kaza et al., 2015). Indonesia occupies a central position within this global challenge. As the world's fourth most populous country and home to Southeast Asia's largest metropolitan area, Jakarta generates approximately 7,500 tonnes of municipal solid waste each day, of which only 60–65 per cent is formally collected (Al-Hamasy, 2026).

C.1 The Role of Economic Analysis of Law in Achieving Efficiency and Effectiveness of Waste Management Legislation in Jakarta

The principal legislative framework governing waste management in Indonesia is Law No. 18 of 2008 on Waste Management (hereinafter referred to as the Waste Management Law). Enacted as a significant departure from the regulatory approach adopted under Law No. 23 of 1997 on Environmental Management, the Waste Management Law introduced an integrated waste management paradigm encompassing waste reduction at source, collection, utilisation, processing, and final disposal. Article 4 establishes the principal objectives of waste management, namely the protection of public health, the improvement of environmental quality, and the promotion of economic efficiency. Article 5 further incorporates a rights-based approach by recognising the right of every person to receive waste management services that are environmentally sound and sustainable.

The regulatory framework implementing the Waste Management Law includes Government Regulation No. 81 of 2012 on Household Waste Management, Minister of Environment and Forestry Regulation No. P.75/MENLHK/SETJEN/KUM.1/10/2019 on the Producer Waste Reduction Roadmap, and Minister of Public Works Regulation No. 3 of 2013 on Waste Infrastructure and Facilities. Collectively, these legal instruments establish a comprehensive regulatory framework. However, as this study demonstrates, the framework remains institutionally fragmented and economically incomplete because it lacks effective economic instruments capable of creating incentives for regulatory compliance and behavioural change.

Within this regulatory framework, the government performs a central role as regulator by formulating public policies, providing fiscal incentives, and enforcing environmental legislation. Boadi-Mensah, argues that consistent law enforcement, adequate resource allocation, and efficient recycling systems are essential to improving the efficiency, accountability, and sustainability of urban waste management. Nevertheless, effective waste governance cannot rely solely on governmental intervention. It also requires active participation from other stakeholders, including investment by the private sector in technological innovation, the development of institutional capacity, and collaborative initiatives to support smart, incentive-based waste management systems (Boadi-Mensah, 2023).

In addition to its regulatory function, the government also serves as a facilitator and catalyst for public participation by promoting environmental awareness, encouraging innovation, and providing technical assistance to communities engaged in waste management activities. Such initiatives strengthen the implementation of circular economy principles while simultaneously creating opportunities for community-based economic development and income generation (Pratiwi et al., 2025).

At the sub-national level, the Special Capital Region of Jakarta (DKI Jakarta) exercises concurrent authority over waste management pursuant to Article 18 of Law No. 18 of 2008 on Waste Management and the decentralisation framework established under Law No. 23 of 2014 on Regional Government. The principal implementing regulation is DKI Jakarta Governor Regulation No. 77 of 2020 on Waste Management. Institutionally, waste governance is administered by the Jakarta Environmental Agency (*Dinas Lingkungan Hidup*—DLH) as the lead regulatory authority, supported by sub-district Cleansing Implementation Units, private waste transportation contractors, and the Bantar Gebang Integrated Waste Processing Facility (*Tempat Pengolahan Sampah Terpadu*—TPST Bantar Gebang), which operates under an intergovernmental cooperation agreement between the Provincial Government of DKI Jakarta and the Bekasi City Government.

Operational responsibilities for waste collection are distributed across Jakarta's five administrative municipalities—North, Central, East, West, and South Jakarta—each of which maintains its own operational management structure. These responsibilities are further decentralised to sub-districts (*kecamatan*), urban villages (*kelurahan*), and neighbourhood organisations (*Rukun Warga* and *Rukun Tetangga*). Harfadli et al., observe that informal community-based waste actors perform a substantial proportion of primary waste collection in many Indonesian cities (Harfadli et al., 2025). However, despite their significant contribution, these actors remain largely excluded from the formal regulatory system because no comprehensive legal framework provides for their institutional recognition, financing, or operational coordination.

From the perspective of Economic Analysis of Law (EAL), environmental pollution constitutes a negative externality arising from production and consumption activities whose social costs are not fully reflected in market prices. As Wibisana argues, environmental law should function as a mechanism for internalising these externalities by ensuring that environmental costs are incorporated into economic decision-making and reflected in the true price of goods and services (Wibisana, 2017).

An economic analysis of the Waste Management Law and its implementing regulations reveals three fundamental structural deficiencies. First, the regulatory framework remains predominantly command-and-control in orientation, relying primarily on administrative and criminal sanctions as the principal mechanisms for securing compliance. Such an approach provides limited incentives for voluntary compliance or behavioural change. Apriadi et al., demonstrate that the implementation of waste management policies in Indonesia continues to suffer from a substantial enforcement gap, with existing regulatory instruments proving ineffective in deterring non-compliance by both public institutions and private actors (Apriadi et al., 2024).

This assessment is reinforced by Prasetyo and Narutomo, who conclude that Indonesia's waste management regime remains excessively dependent on punitive enforcement while failing to incorporate incentive-based regulatory instruments. Consequently, waste management performance remains suboptimal because of inadequate infrastructure, limited

public participation, fragmented governance between central and regional governments, and insufficient cross-sectoral coordination (Prasetyo & Narutomo, 2025).

C.2 Ideal Regulatory Model for Waste Management in Jakarta

Jakarta's waste governance system exhibits the defining characteristics of institutional fragmentation. Regulatory authority and operational responsibilities are dispersed across multiple levels of government without effective coordination or clearly delineated accountability mechanisms. At the national level, waste management falls within the jurisdiction of several ministries with overlapping mandates. At the provincial level, the Jakarta Environmental Agency (*Dinas Lingkungan Hidup*—DLH), the Public Works Agency, and the Regional Secretariat exercise concurrent responsibilities. Operationally, waste management also depends on private contractors, informal waste collectors, and community-based waste banks, yet these actors remain inadequately integrated into the formal regulatory framework.

Such institutional fragmentation generates substantial transaction costs that undermine regulatory efficiency and reduce the effectiveness of waste governance. From the perspective of Economic Analysis of Law (EAL), the absence of a single institution with clearly defined authority, responsibility, and accountability for waste management constitutes a fundamental defect in the regulatory design. Harfadli et al., argue that the principal obstacle to effective waste governance is not the scarcity of financial or technical resources, but rather the exclusion of informal waste actors from planning processes, the absence of long-term integrated waste management strategies, and weak coordination between formal governmental institutions and community-based actors responsible for a significant proportion of primary waste collection (Harfadli et al., 2025).

The Waste Management Law (Law No. 18 of 2008) required all open dumping sites to be closed within five years of its enactment, meaning that this obligation should have been fulfilled by 2013. However, empirical evidence indicates that many local governments lacked the institutional capacity, financial resources, and administrative preparedness necessary to implement this transition effectively. Harfadli et al., identify several interrelated causes of this governance failure, including limited institutional capacity, inadequate resource allocation, the absence of formal legal recognition for informal waste actors, and a persistent mismatch between statutory mandates and local implementation realities. Their findings suggest that sustainable urban waste governance in Indonesia requires a comprehensive institutional framework that formally integrates both governmental and informal actors, rather than relying exclusively on top-down technical or administrative interventions (Harfadli et al., 2025).

The most fundamental source of economic inefficiency within Jakarta's waste management system lies in the absence of effective price signals. The existing fee structure is largely disconnected from the marginal social cost of waste generation and disposal, thereby failing to influence the behaviour of waste generators. Euis Nurhayati and Sri Nurhayati demonstrate that waste service fees in Indonesian cities are generally set at levels insufficient both to generate adequate public revenue and to create meaningful economic incentives for waste reduction. Furthermore, the absence of effective enforcement mechanisms for non-payment and illegal dumping significantly weakens regulatory compliance. Under these conditions, the prevailing system resembles a classic tragedy of the commons, in which the private cost of waste generation remains negligible while the resulting social costs—including environmental pollution, flooding caused by clogged drainage

systems, and adverse public health impacts—are borne collectively by society (Nurhayati & Nurhayati, 2023).

Adi and Rarasati, further demonstrate through computational modelling that landfill tipping fees in Indonesia are set substantially below actual operational costs. As a consequence, waste generators face little or no economic incentive to minimise waste generation, promote reuse, or increase recycling activities. In the absence of Pigouvian pricing mechanisms capable of internalising environmental externalities, waste disposal remains artificially inexpensive from the perspective of private actors, thereby reinforcing economically inefficient behaviour (Adi & Rarasati, 2021).

The enforcement of waste management regulations in Jakarta is further constrained by limited administrative capacity and a relatively weak sanctions regime. Effective regulatory enforcement therefore requires stronger institutional coordination among government agencies, the private sector, and other stakeholders to establish a coherent legal and policy framework. Such a framework should encourage innovation in recycling through appropriate economic incentives while simultaneously supporting investment in waste management infrastructure that is responsive to both economic efficiency and broader social objectives.

From the perspective of Economic Analysis of Law (EAL), the most significant governance failure lies in the inability of the existing regulatory framework to internalise the negative externalities generated by inadequate waste management. As Roy explains, waste generation represents a classic example of a negative externality because the social costs of waste disposal are not reflected in the private costs incurred by waste generators (Listiningrum et al., 2023). According to the Coasean framework, environmental externalities may be internalised either through efficient bargaining under conditions of low transaction costs or through appropriately designed legal and economic instruments when such conditions are absent. Indonesia's current waste management regime effectively relies on neither approach. It neither incorporates Pigouvian taxes or equivalent economic instruments capable of pricing the social costs of waste generation, nor establishes market-based mechanisms that reflect the scarcity value of landfill capacity. Consequently, the existing regulatory framework fails to create incentives that encourage socially efficient waste management behaviour.

The informal waste sector—comprising waste pickers (*pemulung*), itinerant waste buyers, and small-scale recyclers—plays a significant role in Jakarta's recycling system, diverting an estimated 15–20 per cent of the city's waste from final disposal. Kristanto et al., report that, across five major Indonesian cities, informal waste pickers account for approximately 12 per cent of total recycling activities while earning an average monthly income of only USD 91.7. Despite their substantial contribution to resource recovery, their activities remain largely invisible within formal waste accounting systems. The study further demonstrates that informal waste workers achieve higher levels of resource recovery per unit cost than the formal waste management system, yet they continue to be excluded from policy formulation and face persistent institutional, social, and occupational safety vulnerabilities (Kristanto et al., 2022).

From the perspective of Economic Analysis of Law (EAL), this dualistic regulatory structure represents both a market failure and a government failure. An economically efficient informal recycling system operates without formal legal recognition, institutional support, or economic incentives, whereas the comparatively less efficient formal system receives the majority of public financial resources. This regulatory imbalance produces

inefficient resource allocation and prevents the legal framework from maximising the social value generated by informal waste recovery activities.

Jakarta's waste stream should therefore be viewed not merely as an environmental burden but also as a valuable economic resource that remains systematically undervalued under the existing regulatory framework. Kurniawan and Hartono demonstrate that adequate budget allocation significantly improves waste collection performance in Indonesian cities and that waste management systems incorporating cost-recovery mechanisms are capable of achieving both financial sustainability and broader service coverage. Nevertheless, this economic potential remains largely unrealised because the existing system lacks effective source-separation infrastructure and market mechanisms that would enable recyclable materials to realise their full economic value.

Apriadi et al., analysed plastic waste management policy instruments in Indonesia using a system dynamics approach. Their findings indicate that plastic waste reduction can be achieved more effectively through hybrid regulatory strategies, including the integration of Extended Producer Responsibility (EPR) schemes with recycling centres, or through the combined implementation of a plastic bag levy and a plastic bag ban (Apriadi et al., 2024).

These findings illustrate a broader regulatory gap characterised by inadequate incentive structures, weak enforcement mechanisms, and the limited integration of market-based instruments into Indonesia's waste management regime. From an Economic Analysis of Law (EAL) perspective, such deficiencies reflect a failure to align the incentives of public authorities, producers, consumers, and informal waste actors within a coherent regulatory framework capable of promoting socially efficient and environmentally sustainable waste governance.

Applying the Economic Analysis of Law (EAL) framework to Indonesia's waste governance system, Listiningrum et al., argue that the existing regulatory architecture is characterised by institutional fragmentation, the absence of binding economic instruments, and limited integration of smart city technologies. Collectively, these deficiencies transform the regulatory framework from a mechanism intended to correct market failures into a source of systemic inefficiency (Listiningrum et al., 2023).

Within the Indonesian waste management context, the continued operation of open dumping sites despite their statutory prohibition can be explained by distorted political and economic incentives. Local governments often lack political incentives to introduce cost-recovery waste service charges because of electoral considerations, while the closure of disposal sites frequently requires politically sensitive land acquisition and significant fiscal commitments. At the same time, limited institutional transparency creates opportunities for rent-seeking and weakens regulatory accountability. Euis Nurhayati and Sri Nurhayati identify institutional opacity and accountability deficits as major political constraints on effective waste governance in Indonesian cities (Listiningrum et al., 2023).

Indonesia's PROPER (Program for Pollution Control, Evaluation, and Rating) represents an important regulatory innovation that complements conventional command-and-control approaches through public environmental disclosure. Safraa et al., argue that effective legal and behavioural frameworks for urban waste management should incorporate transparency and public disclosure mechanisms to strengthen accountability and encourage regulatory compliance (Safraa et al., 2023).

Nevertheless, the limitations of the PROPER programme also reveal deeper institutional weaknesses. In its early implementation, PROPER evaluated environmental performance using only three principal indicators—water pollution, air pollution, and hazardous waste management—and generated controversy when companies associated with major environmental incidents, such as PT Lapindo Brantas following the 2006 Sidoarjo mudflow disaster, received a “Blue” performance rating. These experiences illustrate the importance of credible, transparent, and accountable evaluation mechanisms. Safraa et al. further conclude that regulatory systems incorporating transparency and public accountability are more effective in influencing the behaviour of regulated entities than systems relying exclusively on punitive sanctions. This insight has direct relevance for municipal waste governance, particularly through mandatory public disclosure of regulatory compliance, environmental performance, and financial management data (Safraa et al., 2023).

The spatial distribution of waste management infrastructure in Jakarta also reflects and reinforces existing socioeconomic inequalities. Illegal dumping sites, poorly maintained waste collection facilities, and polluted waterways are disproportionately concentrated in low-income communities. Empirical evidence presented by Euis Nurhayati and Sri Nurhayati demonstrates that lower-income neighbourhoods consistently receive inferior waste collection services, resulting in a regressive distribution of environmental burdens in which disadvantaged communities bear a disproportionate share of environmental costs. A similar pattern is evident in the working conditions of informal waste pickers documented by Kristanto et al., who continue to work under hazardous conditions without adequate legal recognition, social protection, or fair economic compensation (Kristanto et al., 2022).

Article 28H(1) of the 1945 Constitution of the Republic of Indonesia guarantees that every person has the right to live in physical and spiritual prosperity, to have adequate housing, to enjoy a good and healthy environment, and to receive healthcare services. This constitutional guarantee is reinforced by Article 65 of Law No. 32 of 2009 on Environmental Protection and Management, which recognises the right of every person to a good and healthy environment and imposes corresponding positive obligations on the State to protect, preserve, and manage environmental quality.

The persistent failure of Jakarta’s waste governance system to prevent environmental pollution, protect public health, and ensure equitable access to waste management services may therefore constitute a failure to fulfil these constitutional obligations. Empirical studies consistently demonstrate that the health impacts, productivity losses, and broader socioeconomic costs associated with inadequate waste management are borne disproportionately by low-income and vulnerable communities. Ironically, these are the same communities that receive the fewest benefits from the substantial public resources allocated to the waste management sector.

From the perspective of Economic Analysis of Law (EAL), these consequences represent classic negative externalities arising from regulatory failure. The social costs generated by ineffective waste management are not internalised by those responsible for producing waste but are instead transferred to society through increased healthcare expenditure, environmental degradation, and reduced economic productivity.

The economic consequences of Jakarta’s waste governance failure are considerable. Applying the World Bank’s environmental cost accounting methodology, a conservative estimate suggests that the annual economic losses associated with waste-related environmental degradation—including healthcare expenditure attributable to pollution

exposure, productivity losses caused by illness, depreciation of property values in affected areas, and the costs of groundwater remediation—may exceed IDR 15–20 trillion each year. Pirmana et al., define environmental costs as the economic losses arising from the reduction of environmental carrying capacity caused by development activities (Pirmana et al., 2021). These costs are ultimately socialised through public expenditure and are borne disproportionately by low-income households, thereby functioning as an implicit regressive burden that exacerbates existing socioeconomic inequalities.

The first pillar of the proposed regulatory reform is the adoption of a mandatory Extended Producer Responsibility (EPR) regime that reallocates the financial and operational responsibility for end-of-life product management from local governments to producers and importers. From an Economic Analysis of Law (EAL) perspective, EPR functions as a mechanism for internalising environmental externalities by aligning private incentives with the social costs of waste generation.

Kuo et al., developed a system dynamics model for aseptic paper packaging waste management in Indonesia and demonstrated that a well-designed EPR financing and subsidy mechanism can significantly improve recycling performance. Their simulation indicates that the recycling capacity of downstream recyclers should serve as the basis for determining producer contributions, thereby ensuring that higher recycling capacity is accompanied by proportionally greater financial support from producers and importers. Accordingly, the optimal policy scenario combines weight-based EPR contributions with targeted subsidies for waste collection partners and recycling enterprises (Kuo et al., 2021).

Complementing this approach, Apriadi et al., propose a hybrid regulatory model that integrates Extended Producer Responsibility (EPR) with market-based policy instruments in Indonesia's plastic waste management system. Their analysis identifies several key regulatory instruments, including mandatory producer responsibility obligations, plastic waste reduction targets, economic incentives for the recycling industry, and deposit-refund schemes designed to increase the recovery and recycling of plastic materials (Apriadi et al., 2024).

A complementary market-based instrument is the implementation of pay-as-you-throw (PAYT) or unit-based waste charging systems, under which households pay waste management fees according to the quantity of waste they generate. Szymańska and Wielechowski, argue that this approach offers a mutually beneficial solution by ensuring that waste management costs are borne by those who generate waste, thereby strengthening the polluter pays principle and creating direct economic incentives for waste reduction (Szymańska & Wielechowski, 2021).

Drawing on the experience of the German state of Baden-Württemberg, the authors note that households are charged according to the amount of municipal solid waste they produce, consisting of an annual basic fee for a standard 40-litre waste bin and an additional charge calculated on the basis of each kilogram of waste exceeding the standard allocation. Based on this model, they propose that Indonesia adopt a comparable pricing structure consisting of an annual basic charge of approximately IDR 600,000 for a 40-litre waste bin and an additional fee of IDR 1,000 per kilogram of excess waste. Such a unit-pricing mechanism provides households with direct financial incentives to minimise waste generation, reduce unnecessary consumption, and choose products with recyclable or reduced packaging, thereby reinforcing circular economy objectives through market-based behavioural incentives (Szymańska & Wielechowski, 2021).

Another market-based instrument that merits incorporation into Indonesia's waste governance framework is the Deposit-Refund System (DRS). Under this mechanism, consumers pay a refundable deposit at the point of purchase, which is reimbursed when the used packaging is returned for recycling. From an Economic Analysis of Law (EAL) perspective, the DRS internalises environmental externalities by assigning an explicit economic value to post-consumption packaging, thereby encouraging its recovery and recycling. Jadayil and Aqil, argue that this mechanism not only generates financial resources to support reuse and recycling but also achieves source reduction at a lower cost than unit-based waste charging systems alone (Jadayil & Aqil, 2023).

Germany's experience with the Green Dot (*Grüner Punkt*) system demonstrates the effectiveness of deposit-based schemes in increasing resource recovery. Mandatory deposits on non-reusable beverage packaging have enabled recycling rates exceeding 90 per cent for beverage containers. Drawing on this experience, Indonesia could initially implement a DRS for plastic beverage bottles and aseptic packaging, with deposit values calibrated to local income levels, administrative costs, and market conditions to ensure both economic efficiency and public acceptance.

A comprehensive regulatory model should also recognise and integrate, rather than displace, the existing informal waste sector. Kristanto et al., demonstrate that informal waste collection networks achieve higher resource recovery per unit cost than the formal waste management system. They further argue that integrating waste pickers into the formal regulatory framework through legal recognition, occupational safety protection, fair remuneration, and inclusion within official waste accounting systems is essential to improving both environmental performance and social equity (Kristanto et al., 2022).

Accordingly, the proposed regulatory framework should provide for the registration and licensing of waste pickers, facilitate the establishment of cooperatives to strengthen their bargaining position, and expand access to microfinance and capacity-building programmes. Such measures would reduce transaction costs, improve institutional coordination, and increase the efficiency of resource recovery, thereby aligning the incentives of informal waste actors with broader public policy objectives.

This approach is further supported by Harfadli et al., whose study of the informal waste sector across Indonesian cities provides a practical model for community-based waste governance. Their research demonstrates that informal waste actors already perform a substantial share of primary resource recovery despite receiving limited legal recognition and institutional support (Harfadli et al., 2025).

Accordingly, a community-based waste governance model should incorporate three principal elements: (a) formal legal recognition of community-level waste management actors within the national regulatory framework; (b) the establishment of cooperative institutions to strengthen bargaining power and ensure equitable distribution of revenue from recyclable materials; and (c) the implementation of transparent, cost-reflective waste service charges through which all waste generators contribute fairly to the financing of waste management services.

Consistent with this approach, Kurniawan and Hartono demonstrate that adequate fiscal investment, transparent fee management, and the formal integration of informal waste sector contributions produce measurable improvements in both economic efficiency and waste diversion performance. Collectively, these measures establish an institutional framework that

is more consistent with the principles of Economic Analysis of Law, as it aligns legal rules with economic incentives while promoting environmental sustainability and social justice.

Effective waste governance in Indonesia requires a coherent combination of regulatory instruments that integrates market-based mechanisms, economic incentives, and transparent enforcement measures to complement and regulate the activities of both public and private waste service providers. From an Economic Analysis of Law (EAL) perspective, an effective regulatory framework should minimise transaction costs, align the incentives of all stakeholders, and promote efficient compliance rather than relying exclusively on command-and-control regulation. Accordingly, the proposed normative model should be supported by comprehensive implementing regulations governing standardised public-private partnership (PPP) contract provisions, minimum service standards, transparent procurement procedures, performance monitoring systems, and effective dispute resolution mechanisms.

Digital technologies also offer significant opportunities to enhance regulatory efficiency and institutional accountability. Smart waste governance systems that integrate sensor-enabled collection infrastructure, artificial intelligence (AI)-based route optimisation, blockchain-supported traceability of recyclable materials, and digital tracking of waste flows from generation to final disposal can substantially reduce the transaction costs associated with monitoring, regulatory enforcement, and inter-agency coordination. To enable these innovations, the legal framework should require waste management operators to disclose operational data, establish interoperable standards for waste information systems, recognise authenticated digital tracking records as admissible evidence in regulatory enforcement proceedings, and safeguard the data rights and privacy of affected communities.

The proposed regulatory model should further be embedded within a national Circular Economy roadmap containing legally binding targets, measurable performance indicators, and clear implementation timelines. Kurniawan et al., demonstrate that integrating Industry 4.0 technologies with community-based circular economy initiatives can significantly increase recycling rates, reduce dependence on landfills, and achieve measurable reductions in waste-related greenhouse gas emissions (Kurniawan et al., 2021).

Accordingly, the roadmap should incorporate at least five key policy commitments: (a) mandatory waste separation at source; (b) a legally binding national recycling target of 50 per cent by 2030; (c) a phased elimination of single-use plastics through a defined implementation schedule; (d) green public procurement policies that prioritise products containing recycled materials; and (e) fiscal incentives to stimulate investment in the recycling industry and broader circular economy enterprises. Collectively, these measures would create a regulatory framework that better internalises environmental externalities, strengthens legal certainty, and aligns economic incentives with the long-term objectives of sustainable urban waste governance.

D. Conclusion

This study demonstrates that Jakarta's waste governance crisis is fundamentally a problem of regulatory design rather than merely one of technical capacity or environmental management. Although Indonesia has established a comprehensive legal framework for waste management, the existing regulatory regime has failed to generate the economic incentives necessary to promote efficient resource allocation, behavioural change, and sustainable waste management practices. Institutional fragmentation, weak enforcement, limited internalisation of environmental externalities, inadequate pricing mechanisms, and

the exclusion of informal waste actors collectively produce persistent inefficiencies that undermine both environmental protection and the constitutional right to a good and healthy environment.

Applying the Economic Analysis of Law (EAL) framework provides a robust explanation for these governance failures by demonstrating how high transaction costs, information asymmetries, poorly aligned incentive structures, and political economy constraints reinforce an inefficient regulatory equilibrium. Rather than correcting market failures, the current legal framework often perpetuates them through fragmented institutions, insufficient economic instruments, and limited accountability mechanisms.

Accordingly, improving waste governance in Indonesia requires a fundamental shift from a predominantly command-and-control approach towards an integrated, incentive-compatible regulatory model. Such a model should combine mandatory Extended Producer Responsibility (EPR), market-based instruments including pay-as-you-throw and deposit-refund systems, formal integration of the informal waste sector, community-based waste governance, transparent and performance-oriented public-private partnership arrangements, digital governance technologies, and a legally binding national circular economy roadmap. Collectively, these regulatory reforms would strengthen environmental accountability, reduce transaction costs, internalise environmental externalities, and align public and private incentives with the objectives of sustainable urban waste governance.

The findings of this study also generate important policy implications. Regulatory reform should prioritise the modernisation of Indonesia's waste legislation through the incorporation of binding EPR obligations, market-based pricing mechanisms, integrated national waste information systems, institutional coordination across levels of government, and formal legal recognition of the informal recycling sector. At the same time, producers should assume greater responsibility for post-consumer waste management through transparent environmental reporting, investment in collection and recycling infrastructure, and active participation in EPR schemes. Universities, researchers, civil society organisations, and the media likewise have a critical role in strengthening the empirical evidence base, advancing scholarship in Economic Analysis of Environmental Law, and promoting greater public accountability in waste governance.

While this study offers a normative legal analysis supported by empirical evidence from previous research, it does not quantify the economic costs and benefits of the proposed regulatory reforms. Future research should therefore undertake empirical evaluations of waste-related externalities, regulatory costs, and the economic impacts of alternative policy instruments across Indonesian cities. Such evidence would further strengthen the design of efficient, equitable, and environmentally sustainable waste governance based on the principles of Economic Analysis of Law.

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