JAMBURA LAW REVIEW
JALREV VOLUME 8 ISSUE 2 2026
ISSN PRINT: 2654-9266
ISSN ONLINE: 2656-0461

Ecological Derogation and Uniform Waste-to-Energy Mandates: A Socio-Legal Critique of Indonesia's Recentralized Regime

1st Suprapto
2nd Dina Imam Supaat
3rd Saprudin

[1,3]Universitas Lambung Mangkurat, Banjarmasin, Indonesia.
[2]Universiti Sains Islam Malaysia, Nilai, Malaysia.

✉ *suprapto@ulm.ac.id*

Article Info

Submitted: *December 20, 2025*
Revised: September 3, 2026
Accepted: November 8, 2026

Keywords:
Administrative Law; Ecological Derogation; Readiness Test; Regional Fiscal Capacity; Waste-to-Energy Governance.

How to cite *[Chicago Manual of Style 17th edition (full note)]*: Suprapto, Dina Imam Supaat, and Saprudin, "Ecological Derogation and Uniform Waste-to-Energy Mandates: A Socio-Legal Critique of Indonesia's Recentralized Regime," *Jambura Law Review* 8, no. 2 (2026): 712-743.

Abstract

Decentralized states often apply uniform infrastructure mandates to ecologically diverse territory. Indonesia's Presidential Regulation No. 109 of 2025 recentralizes waste-to-energy (WtE) investment, yet it still requires regional governments to provide land, guarantee waste supply, and finance waste hauling. Existing scholarship treats the resulting barriers as technical or managerial and has not asked whether ecological conditions should shape the legal design of the mandate itself. This article examines how the regulation operates in the Banjarbakula wetland region of South Kalimantan and how the law should respond. Following a normative-empirical, socio-legal design, the study combines statutory and conceptual analysis, a structured comparison with China, the Philippines, and Malaysia, and process-tracing of nine documentary sources on the Banjarbakula Regional Landfill. Three findings emerge. Voluntary inter-regional cooperation is structurally fragile under wetland logistics. Fiscal risk migrates from processing to hauling and downstream services that regional budgets must fund. High-moisture waste creates a technology-performance risk that should rest with project implementers. The article's principal contribution is to treat ecoregional constraint as a legal condition rather than as background context and to operationalize that claim through an ecological derogation clause anchored in Indonesia's constitutional recognition of regional diversity. A three-limbed readiness test, an auditable hauling-cost trail, and a fitness-for-purpose warranty turn the claim into administrable safeguards.

@2026 – Suprapto, Dina Imam Supaat, and Saprudin.
Under the license CC BY-SA 4.0.

Introduction

Indonesia faces an urban-waste emergency of constitutional proportions. The country generates roughly 144,000 tonnes of waste per day, and about 75 percent of it (some 108,600 tonnes) remains unmanaged. This waste accumulates along roadsides, rivers, and coastlines and releases methane, a greenhouse gas far more potent than carbon dioxide.[1] The state's response rests on three constitutional provisions. Article 33(3) of the 1945 Constitution vests control over land, water, and natural resources in the state for the greatest prosperity of the people; Article 33(4) requires the economy to follow principles that include sustainability and environmental awareness; and Article 28H(1) guarantees the right to a good and healthy environment.[2] Read through the lens of the "green constitution," these provisions impose a duty of stewardship that binds waste and energy policy to precaution, intergenerational justice, and Indonesia's Nationally Determined Contribution under the Paris Agreement.[3]

Against this backdrop, the government enacted Presidential Regulation No. 109 of 2025 on the Handling of Urban Waste Through the Processing of Waste into Renewable Energy Based on Environmentally Sound Technology, which revokes Presidential Regulation No. 35 of 2018.[4] The regulation recognizes four pathways: waste-to-electricity (*Pengolahan Sampah menjadi Energi Listrik*, PSEL), bioenergy, renewable liquid fuel, and by-products. This article examines PSEL, the thermal pathway. The regulation also recentralizes investment. The 2018 regime left project initiation to regional governments, whereas the new regime gives the Daya Anagata Nusantara Investment Management Agency (Danantara) a decisive role in supporting investment and selecting the PSEL Development and Management Business Entity. It secures that investment through a long-term offtake obligation on the State Electricity Company (*Perusahaan Listrik Negara*, PLN).[5] The purchase price is fixed at USD 0.20 per kWh for thirty years, without negotiation or escalation, subject only to ministerial review "in certain circumstances."[6]

---

[1] Sistem Informasi Pengelolaan Sampah Nasional (SIPSN), KLH/BPLH, verified data, 2026 update (35,591 tonnes per day managed; 108,567 tonnes per day unmanaged), https://sampahnasional.kemenlh.go.id/ (accessed November 6, 2026). See also United Nations Environment Programme, *Global Waste Management Outlook 2024: Beyond an Age of Waste* (Nairobi: UNEP, 2024), https://doi.org/10.59117/20.500.11822/44939.

[2] Undang-Undang Dasar Negara Republik Indonesia Tahun 1945 [1945 Constitution of the Republic of Indonesia], art. 33(3) and (4), and art. 28H(1).

[3] Jimly Asshiddiqie, *Green Constitution: Nuansa Hijau Undang-Undang Dasar Negara Republik Indonesia Tahun 1945* (Jakarta: Rajawali Pers, 2009), 88; Ministry of Environment and Forestry, *Enhanced Nationally Determined Contribution Republic of Indonesia* (Jakarta: MoEF, 2022), 12.

[4] Peraturan Presiden Nomor 109 Tahun 2025 tentang Penanganan Sampah Perkotaan Melalui Pengolahan Sampah Menjadi Energi Terbarukan Berbasis Teknologi Ramah Lingkungan [Presidential Regulation No. 109 of 2025], arts. 3 and 32.

[5] Presidential Regulation No. 109 of 2025, arts. 5(1), 14(1), and 15 (Danantara as selector of the PSEL Development and Management Business Entity, BUPP PSEL, and as investor); arts. 5(2), 19(1), 19(8), and 20 (PLN's thirty-year purchase obligation and compensation to PLN). On the wider consolidation of executive authority within which this recentralization takes place, see Usman Rasyid, "Absorptive Backsliding: Coalitional Erosion and Constitutional Resilience in Indonesia, Hungary, and Poland," *Journal of Constitutional Change* 1, no. 1 (2026): 1–23, https://doi.org/10.66502/w05y0e96.

[6] Presidential Regulation No. 109 of 2025, art. 19(2), (3), (6)(a), and (8). See also "PLN Wajib Beli Listrik Pembangkit Sampah 20 Sen per kWh Tanpa Negosiasi," *Bisnis.com*, October 15, 2025, https://hijau.bisnis.com/read/20251015/652/1920551/pln-wajib-beli-listrik-pembangkit-sampah-20-sen-per-kwh-tanpa-negosiasi; "PLN Jamin Serap Seluruh Listrik PSEL Selama 30 Tahun," *Antara News*, July

According to PLN's president director, this price absorbs the margin that regional budgets previously paid as a tipping fee: under the 2018 scheme, PLN paid about USD 0.13 per kWh and regional budgets covered the remaining USD 0.07.[7] The tariff thus embeds a large, long-dated public commitment. Regional governments keep three tasks: providing clean-and-clear land, guaranteeing waste supply, and financing collection and hauling from their budgets (*Anggaran Pendapatan dan Belanja Daerah*, APBD).

This design meets a hard test outside Java. Its initial phases target a limited set of agglomeration-based locations and leave most of Indonesia's 514 regencies and cities outside its direct reach.[8] The tariff and eligibility criteria also apply uniformly. They do not distinguish Java's mature logistics and stable volcanic terrain from Kalimantan's wetland frontiers, with their poor connectivity and unstable peat. When a uniform norm meets a heterogeneous landscape, its intended benefit can turn into regional loss, a pattern this article calls policy dissonance. In the Banjarbakula metropolitan region of South Kalimantan, haulers carry waste from low-lying peat-swamp areas in Banjarmasin and Barito Kuala to a site on firmer ground in Banjarbaru. Swampy routes accelerate fleet depreciation and push fuel costs well above national assumptions. The region's organic waste also holds more than sixty percent moisture, which makes it ill-suited to large-scale thermal conversion. This article argues that such ecoregional conditions are legal variables, because they bear on the design of authority, service standards, and fiscal responsibility.

The article uses the term "geographic determinism" and therefore fixes its meaning at the outset. In its strong form, associated with Diamond and, in economics, with Sachs, the thesis holds that physical geography determines the developmental fate of societies. Acemoglu, Johnson, and Robinson, and Rodrik, Subramanian, and Trebbi, have shown that institutions explain income differences better than geography does.[9] This article adopts only a weak, bounded sense of the term, equivalent to *ecoregional constraint*: a

16, 2026, https://www.antaranews.com/berita/5652081/pln-jamin-serap-seluruh-listrik-psel-selama-30-tahun.

[7] Statement of PLN President Director Darmawan Prasodjo before Commission VI of the House of Representatives, reported in "Ini Alasan Tarif Listrik PLTSa Naik Jadi US$20 Sen per kWh," *Warta Ekonomi*, November 20, 2025, https://wartaekonomi.co.id/read590815/ini-alasan-tarif-listrik-pltsa-naik-jadi-us20-sen-per-kwh.

[8] The 2018 regime designated twelve priority cities. On the seven agglomeration areas named as potential first-phase PSEL locations (Yogyakarta, Denpasar, Bogor, Bekasi, Tangerang, Medan, and Semarang), see Kementerian Lingkungan Hidup, "Menteri LH Sampaikan Potensi Lokasi Pembangunan PSEL, Dorong Transformasi Sampah Jadi Energi Listrik Nasional," October 9, 2025, https://kemenlh.go.id/news/detail/menteri-lh-sampaikan-potensi-lokasi-pembangunan-psel-dorong-transformasi-sampah-jadi-energi-listrik-nasional; on the 416 regencies and 98 cities, see Keputusan Menteri Dalam Negeri Nomor 300.2.2-2138 Tahun 2025 tentang Pemberian dan Pemutakhiran Kode, Data Wilayah Administrasi Pemerintahan, dan Pulau.

[9] Jared Diamond, *Guns, Germs, and Steel: The Fates of Human Societies* (New York: W. W. Norton, 1997); Jeffrey D. Sachs, "Institutions Don't Rule: Direct Effects of Geography on Per Capita Income," NBER Working Paper No. 9490 (Cambridge, MA: National Bureau of Economic Research, 2003); Daron Acemoglu, Simon Johnson, and James A. Robinson, "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution," *Quarterly Journal of Economics* 117, no. 4 (2002): 1231–94; Dani Rodrik, Arvind Subramanian, and Francesco Trebbi, "Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development," *Journal of Economic Growth* 9, no. 2 (2004): 131–65.

physical condition of a specific ecoregion that fixes the operating envelope of a legal norm and that no ordinary policy instrument can remove within the norm's time frame. Two causal pathways answer the institutionalist objection. The thermodynamic pathway, the high moisture and low calorific value of wetland waste, belongs to the ecoregion itself and cannot be reduced to institutional choice. The logistical-fiscal pathway (fleet, fuel, and downstream capacity) is largely institutional, and there the article claims only that the wetland substrate aggravates constraints that institutions have produced.

Legal scholarship on Indonesian waste and energy governance leaves this problem unaddressed. Maskun and colleagues propose an institutional harmonization council to resolve conflicts between national and regional norms; Listiningrum and colleagues examine waste-law reform toward smart cities; and Sudirman and colleagues find that the waste-to-energy (WtE) framework lacks a robust compliance mechanism.[10] Turnip and Hasibuan show how oscillation between central control and regional autonomy can both block local stewardship and license local harm.[11] Studies of waste-to-energy in the Global South identify drivers, barriers, and financing constraints, yet they treat geography as context rather than as a legal category.[12] The environmental-federalism literature, from Esty's multitier structure to Millimet's empirical survey and Roesler's account of local authority, frames the question as the vertical allocation of power. It does not address the defeat of a national norm by a region's physical ecology.[13]

[10] Maskun Maskun et al., "Harmonization between National Policy and Regional Regulations in Solid Waste Management in Indonesia: A Normative-Empirical Legal Analysis," *Jambura Law Review* 7, no. 2 (2025): 726–65, https://doi.org/10.33756/jlr.v7i2.31141; Prischa Listiningrum et al., "Waste Management Without Direction in Indonesia: A Proposed Legal Reform Towards Smart Cities," *Legality: Jurnal Ilmiah Hukum* 31, no. 2 (2023): 224–44, https://doi.org/10.22219/ljih.v31i2.27375; Lu Sudirman et al., "Realigning Indonesian Waste-to-Energy Policies with SDG 11: Analysis of Legal Compliance and Its Implications," *Jurnal Pembaharuan Hukum* 11, no. 2 (2024): 282–300, https://doi.org/10.26532/jph.v11i2.36832.

[11] Immanuel Harri Turnip and Marhara Hasibuan, "Central Control vs. Local Liberties: Environmental Stewardship in Indonesia's Power Struggle," *Indonesian Journal of Environmental Law and Sustainable Development* 3, no. 1 (2024): 31–60, https://doi.org/10.15294/ijel.v3i1.78895. On the transfer of regional licensing, spatial-planning, and environmental powers to the center, see Ade Yuliasih et al., "Constitutional Consistency of Indonesia's Job Creation Law and Its Impact on Regional Autonomy," *Jambura Law Review* 8, no. 1 (2026): 190–209, https://doi.org/10.33756/jlr.v1i1.34262.

[12] Imran Khan, Shahariar Chowdhury, and Kuaanan Techato, "Waste to Energy in Developing Countries—A Rapid Review: Opportunities, Challenges, and Policies in Selected Countries of Sub-Saharan Africa and South Asia towards Sustainability," *Sustainability* 14, no. 7 (2022): 3740, https://doi.org/10.3390/su14073740; Portia Adade Williams et al., "Review of Barriers to Effective Implementation of Waste and Energy Management Policies in Ghana: Implications for the Promotion of Waste-to-Energy Technologies," *Waste* 1, no. 2 (2023): 313–32, https://doi.org/10.3390/waste1020021; Trang D. T. Nguyen, Kosuke Kawai, and Toyohiko Nakakubo, "Drivers and Constraints of Waste-to-Energy Incineration for Sustainable Municipal Solid Waste Management in Developing Countries," *Journal of Material Cycles and Waste Management* 23, no. 4 (2021): 1688–97, https://doi.org/10.1007/s10163-021-01227-2.

[13] Daniel C. Esty, "Revitalizing Environmental Federalism," *Michigan Law Review* 95, no. 3 (1996): 570–653; Daniel L. Millimet, "Environmental Federalism: A Survey of the Empirical Literature," *Case Western Reserve Law Review* 64, no. 4 (2014): 1669–1757; Shannon M. Roesler, "Federalism and Local Environmental Regulation," *UC Davis Law Review* 48, no. 3 (2015): 1111–69. On the gap between constitutional duties and subnational administrative capacity in environmental governance, see Tri Delvi GM Nggilu, Fenty Puluhulawa, and Apripari, "The Constitutional Duty–Administrative Capacity Gap in Forest Governance:

None of these literatures explains why the same national norm, even when harmonized and financed, produces different legal consequences in different ecoregions, or what a unitary legal order should do about it. This article addresses that gap. It treats the wetland ecoregion as a legal variable that conditions the applicability of a centralized norm, and it links the administrative-law principle of proportionality to the environmental-law concept of the ecoregion. Its principal contribution is the "ecological derogation clause," an ecoregion-based exception that permits bounded adjustment of service-cost, technology, pre-treatment, and supply-assurance standards once a region demonstrates the need through feasibility studies and measurable indicators. Geographic determinism in its weak sense identifies the trigger, the readiness test supplies the evidentiary procedure, and the shift of fiscal risk from processing to hauling explains why the condition matters for regional budgets. The article treats "adaptive federalism" only as a qualified analogy, because that concept presupposes constitutionally distinct sovereigns, which unitary Indonesia lacks. The proposal's domestic anchor is Indonesia's own practice of asymmetric decentralization.

The novelty claim requires qualification. Environmental law already uses derogations keyed to local conditions. The Water Framework Directive provides an exemption procedure, the Industrial Emissions Directive permits derogations from Best Available Techniques where compliance costs are disproportionate, and the Renewable Energy Directive III establishes a bounded derogation regime.[14] Scholarship on "differentiated implementation" also examines how legal flexibility accommodates heterogeneity among implementing units.[15] These derogations, however, run in the opposite direction. RED III presumes that renewable installations serve an overriding public interest and thereby relaxes environmental protection to accelerate deployment, a tension that recent scholarship has criticized.[16] The derogation proposed here relaxes a renewable mandate to protect ecological and fiscal reality where the presupposed technology cannot function as designed. It also differs in setting (a *unitary* state), in trigger (the *physical impossibility of implementation*), and in context (central-subnational fiscal asymmetry in the Global South). The article therefore asks what a derogation must look like when its ground is a physical fact rather than a policy trade-off.

Indonesia and Brazil Compared," *International Journal of Constitutional and Administrative Law* 2, no. 2 (2026): 183–217, https://doi.org/10.66502/05ybef09.

[14] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 (Renewable Energy Directive III), arts. 15b, 15c, and 16f. Cf. Directive 2000/60/EC (Water Framework Directive), art. 4(7); Directive 2010/75/EU (Industrial Emissions Directive), art. 15(4).

[15] Robert Zbíral, Sebastiaan Princen, and Hubert Smekal, "Differentiation through Flexibility in Implementation: Strategic and Substantive Uses of Discretion in EU Directives," *European Union Politics* 24, no. 1 (2023): 102–20, https://doi.org/10.1177/14651165221126072; Alexander Hoppe et al., "Adaptation, Experimentation or Conservation? The Use of Differentiated Implementation under the Energy Efficiency Directive," *JCMS: Journal of Common Market Studies* 63, no. 3 (2025): 745–64, https://doi.org/10.1111/jcms.13647.

[16] Directive (EU) 2023/2413, art. 16f; Massimiliano Montini, "Addressing the Conflicts between Climate-Related Renewable Energy Goals and Environmental Protection Interests under the RED Directive," *European Law Open* 3, no. 1 (2024): 209–19, https://doi.org/10.1017/elo.2024.14.

Problem Statement

Presidential Regulation No. 109 of 2025 conditions regional participation on clean-and-clear land, guaranteed waste supply, and budget capacity for collection and hauling. These prerequisites presuppose a baseline of service capacity, ecoregional uniformity, and infrastructure that many regions outside Java lack. Banjarbakula combines sub-threshold volumes, constrained downstream infrastructure, and wet waste that impairs thermal conversion and inflates logistics costs. Enforcing the prerequisites without a graduated transition therefore risks service disruption and renewed illegal dumping, which would defeat the regulation's own objectives.

This article asks three questions. First, why does voluntary, quota-based inter-regional cooperation fail to secure waste supply under Banjarbakula's wetland conditions? Second, what does the shift of the fiscal burden toward hauling and downstream services mean for bureaucratic behavior and legal risk in regional budgeting and procurement? Third, what legal construction, combining a readiness test, an ecological derogation clause, and the allocation of technology-performance risk in PSEL cooperation agreements, can secure a graduated transition that keeps services running while protecting the regional budget, the public interest, and displaced informal workers? In answering them, the article extends administrative due process beyond adjudication to the government's duty to make data-driven, transparent, and accountable decisions whenever central policy affects local public services.

Methods

This study employs normative-empirical legal research within a socio-legal frame. "Normative-empirical" describes the materials, namely legal norms and documented facts about their operation. "Socio-legal" describes the analytical stance, which treats law as conditioned by the physical and administrative realities in which officials apply it.[17] The doctrinal analysis establishes what the norm requires; the empirical analysis establishes whether, and at what cost, the case can meet it; and the legal evaluation asks what follows from any gap under the general principles of good governance and higher statutes. The study is qualitative. It establishes its causal claim, that the wetland ecoregion defeats a uniform norm, through process-tracing. The analysis reconstructs from the documentary record the mechanism that links moisture, calorific value, haul distance, and fuel consumption to fiscal exposure, and it accepts each step only where a document supports it.[18]

The doctrinal component uses three approaches. The statute approach reads Presidential Regulation No. 109 of 2025, particularly its transfer of investment authority to Danantara, against Law No. 18 of 2008 on Waste Management, Law No. 23 of 2014 on Regional Government, Law No. 30 of 2014 on Government Administration, and Law No. 32 of 2009 on Environmental Protection and Management. The conceptual approach uses

[17] Reza Banakar and Max Travers, *Theory and Method in Socio-Legal Research* (Oxford: Hart Publishing, 2005), 28.
[18] Derek Beach and Rasmus Brun Pedersen, *Process-Tracing Methods: Foundations and Guidelines*, 2nd ed. (Ann Arbor: University of Michigan Press, 2019).

the "green constitution" and the statutory concept of the ecoregion to assess the fit between technology and context. The comparative approach is functional and bounded. It selects three jurisdictions on a diverse-case logic. In China, large-scale waste-to-electricity runs on centralized supply-chain planning and public-private partnership financing. In the Philippines, an incineration ban (Republic Act No. 8749, Section 20) and locally led solid-waste management (Republic Act No. 9003) confine thermal waste-to-energy to the limits set in *MMDA v. Jancom Environmental Corporation*. Malaysia, an ASEAN federation, pursued uniformity through federal legislation (Act 672) but applies it unevenly.[19] The *tertium comparationis* is how national waste-to-energy policy allocates authority, technology choice, and fiscal risk across subnational units. Three criteria guide the comparison: the centralization of investment decisions, the posture toward incineration and ecological safeguards, and the allocation of fiscal risk. China and the Philippines mark the poles on the first two criteria, and Malaysia tests whether regulatory centralization alone removes territorial difference.

The empirical component treats the Banjarbakula Regional Landfill as a single critical case, for two reasons.[20] First, one landfill already serves five regencies and cities under a cooperation agreement, which is precisely the mechanism the regulation contemplates for regions that cannot meet the supply threshold alone. Second, both causal pathways are present and documented there. If agglomeration cannot deliver the threshold where it is already institutionalized, the case exposes with unusual clarity how ecoregional constraint defeats a uniform norm.

Table 1 sets out the documentary evidence. It comprises the regulation and its socialization materials; the official presentation of the Head of the Banjarbakula Regional Waste and Hazardous Waste Management Technical Implementation Unit (*Unit Pelaksana Teknis Daerah*, UPTD); the Regional Waste Mass Balance Report, the Waste Characteristics Test Report, the cooperation agreement (*Perjanjian Kerja Sama*, PKS), and the Regional Landfill Feasibility Study; and peer-reviewed data on the landfill. The authors applied qualitative content analysis with a coding frame drawn from the study's legal categories: normative requirement, physical condition, capacity, cost consequence, and legal consequence. Documentary triangulation secures validity. The analysis uses a figure only where it appears in, or is consistent across, at least one official document and the UPTD's official statements, and the authors removed rather than estimated any figure they could not trace.

[19] Republic Act No. 9003 (Ecological Solid Waste Management Act of 2000); Republic Act No. 8749 (Philippine Clean Air Act of 1999), sec. 20; *Metropolitan Manila Development Authority v. Jancom Environmental Corporation*, G.R. No. 147465 (Sup. Ct. Phil., January 30, 2002); Ye Shen et al., "Impact of Environmental Regulation on Government Subsides [*sic*] of Public-Private Partnership Waste-to-Energy Incineration Projects: Evidence from 66 Cities in China," *Frontiers in Environmental Science* 11 (2024): 1288851, https://doi.org/10.3389/fenvs.2023.1288851; Malaysia, Solid Waste and Public Cleansing Management Act 2007 (Act 672).

[20] On the critical case as a basis for analytical rather than statistical generalization, see Bent Flyvbjerg, "Five Misunderstandings About Case-Study Research," *Qualitative Inquiry* 12, no. 2 (2006): 219–45.

Table 1. *Documentary evidence base*

Code	Document	Type and issuer	Date	Used for
E1	Presidential Regulation No. 109 of 2025	Legal instrument; Government of Indonesia	2025	Readiness criteria and procedure; institutional design (arts. 3, 4, 5, 8, 11–15, 17, 19, 20)
E2	Socialization of the implementation of Presidential Regulation No. 109 of 2025	Official online recording; KLH/BPLH	2025	Readiness statement and verification procedure
E3	Presentation of the Head of the Banjarbakula UPTD, with transcript	Official presentation; UPTD	2024–2025	Intake, quota and realization, equipment, fuel, budget
E4	UPTD field-findings summary	Official summary; UPTD	2025	Update of E3 data
E5	Regional Waste Mass Balance Report (Banjarbakula)	Technical report; DLH South Kalimantan	2024	Generation potential; composition
E6	Waste Characteristics Test Report	Laboratory report; DLH Environmental Laboratory Unit	2023	Calorific value; moisture content
E7	Regional Landfill Feasibility Study	Feasibility study; Provincial Government of South Kalimantan	2023	Site, route, substrate, composition
E8	Cooperation Agreement (PKS) of the Banjarbakula Regional Landfill	Inter-regional agreement	n.d. (as recorded in E3)	Initial quotas; cost adjustment
E9	Maylana et al. (2024)	Peer-reviewed article	2024	Cumulative intake 2019–2023; remaining service life

Note: E1, E2, and E9 are public; the issuing agencies hold E3–E8. The authors use E8 only as recorded in E3.

Research ethics and data availability. The study involved no interviews, surveys, or other interaction with human participants and processed no personal data, so the authors did not seek ethical review. Its evidence consists of legal instruments, official reports, and statements that officials made in their official capacity; the article therefore identifies officials by office. Documents E1, E2, and E9 are public. Documents E3–E8 are available from the issuing agencies, and the corresponding author will share the copies used on reasonable request, subject to the agency's consent. The study treats the 2024–2025 record as the baseline against which it tests the new norm and labels any projection as an assumption. The unit of analysis is the administrative decision and its fiscal consequences, which keeps the inquiry within legal scholarship even as it draws on technical data.

Ecoregional Constraint and the Limits of a Uniform Waste-to-Energy Mandate

1. Analytical Framework: Ecoregion, Asymmetric Decentralization, and Ecological Derogation

Two ideas frame the analysis. The first is the ecoregion. Law No. 32 of 2009 defines an ecoregion as a geographical area that shares characteristics of climate, soil, water, native

flora and fauna, and patterns of human-nature interaction, and it requires environmental planning to follow ecoregions rather than administrative boundaries.[21] A centralized investment regime may secure funding certainty, but it tends to overlook the ecoregional variation that the statute requires planners to respect. The second idea is that constitutional unity does not demand uniform treatment. Article 18A(1) requires central-regional relations to account for regional specificity and diversity, Article 18A(2) requires fair and harmonious financial, service, and resource relations, and Article 18B(1) recognizes regional units of a special character.[22] On this basis, Indonesia already practices asymmetric decentralization in Aceh, Papua, Yogyakarta, and Jakarta.[23] The ecological derogation clause extends that constitutional logic from political, historical, and cultural specificity to ecological specificity, in a narrower form that is sectoral, evidence-based, and time-bound. Comparative environmental-federalism scholarship, which holds that national standards and bounded local deviation can coexist, serves only as an analogy.[24]

2. Geographic Determinism and the Fragility of Voluntary Inter-Regional Cooperation

Presidential Regulation No. 109 of 2025 makes a supply of at least 1,000 tonnes per day the eligibility "gate" for a PSEL project. It adds a budget allocation for collection and hauling, land provided under a free borrow-use arrangement, and a commitment to enact a regulation on cleansing levies.[25] A regency or city that cannot meet the supply criterion may cooperate with its neighbors under provincial coordination through a cooperation agreement (PKS). Law No. 18 of 2008 assigns collection and hauling to regencies and

[21] Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup [Law No. 32 of 2009 on Environmental Protection and Management], art. 1(29) and arts. 5–8. On the place of local ecological knowledge and village authority within the state's environmental responsibility, see Deni Yusup Permana et al., "Integrating Indigenous Wisdom in Environmental Protection: Exploring Village Authority within the Framework of State Responsibility in Indonesia," *Jambura Law Review* 7, no. 2 (2025): 359–89, https://doi.org/10.33756/jlr.v7i2.29582.

[22] 1945 Constitution, arts. 18A(1), 18A(2), and 18B(1).

[23] Undang-Undang Nomor 11 Tahun 2006 tentang Pemerintahan Aceh; Undang-Undang Nomor 21 Tahun 2001 tentang Otonomi Khusus bagi Provinsi Papua, as amended by Undang-Undang Nomor 2 Tahun 2021; Undang-Undang Nomor 13 Tahun 2012 tentang Keistimewaan Daerah Istimewa Yogyakarta; Undang-Undang Nomor 2 Tahun 2024 tentang Provinsi Daerah Khusus Jakarta. See Mexsasai Indra et al., "Asymmetric Regional Development as a Framework for Achieving Spatial and Regional Justice in Indonesia," *Jambura Law Review* 8, no. 1 (2026): 55–75, https://doi.org/10.33756/jlr.v1i1.32047; Muhammad Ridwansyah, "Upaya Menemukan Konsep Ideal Hubungan Pusat-Daerah Menurut Undang-Undang Dasar Negara Republik Indonesia Tahun 1945," *Jurnal Konstitusi* 14, no. 4 (2017): 838–58, https://doi.org/10.31078/jk1447. On the constitutional protection of regional cultural specificity, see Novendri Nggilu, Lisnawaty Wadju Badu, and Suwitno Yutye Imran, "Legal Protection Bonda and Bulango Languange [*sic*]: In Reality and Prospect," *Jambura Law Review* 3, no. 1 (2021): 19–36, https://doi.org/10.33756/jlr.v3i1.6947.

[24] Esty, "Revitalizing Environmental Federalism," 570–653; Roesler, "Federalism and Local Environmental Regulation," 1111–69.

[25] Presidential Regulation No. 109 of 2025, art. 4(1)(a)–(d) and (2); on inter-regional cooperation, art. 11(1)–(2).

cities and authorizes inter-regional cooperation in waste management.[26] The question is whether a voluntary, quota-based instrument can hold under wetland conditions.

The Banjarbakula landfill receives an average of 350–400 tonnes per day, well below the threshold. The initial PKS quota totals 275 tonnes per day across five jurisdictions, and realization fluctuates: Banjarmasin delivers up to roughly 225 tonnes per day, while Tanah Laut has not yet delivered consistently (Table 2).[27] The main source areas, Banjarmasin and Barito Kuala, lie on low-lying peat and soft alluvium, more than thirty kilometers from the landfill on firmer ground at Cempaka, Banjarbaru.[28] Operational fuel rose from about 5,000 liters per month in 2024 to more than 10,000 liters in 2025, while the fleet stayed limited.[29] The record contains no route-level unit-cost calculation, so the article makes no numerical comparison with Java. It relies instead on the documented doubling of fuel use and on the physical determinants of haul cost.

The two causal pathways carry unequal evidentiary weight. The *thermodynamic* pathway is the stronger one. Moisture above sixty percent and a lower heating value of 800–1,100 kcal/kg are properties of a wetland ecoregion, not of poverty. A wealthy city on peat would face the same combustion problem, because the plant must evaporate the water before it can drive the steam cycle. The *logistical-fiscal* pathway supports only a more modest claim. Rising fuel use, an inadequate fleet, a strained leachate plant, and the lack of raw water also afflict low-income regions that are not wetlands. The peat substrate and low elevation do not create these constraints; they *aggravate* them. Soft bearing capacity accelerates fleet depreciation and raises fuel use per tonne-kilometer at any level of fiscal capacity, and the legal consequence follows from that aggravation.

Two legal points follow. First, the variables that decide whether a region meets its quota (distance, travel time, fleet availability, and road bearing capacity) lie beyond any single party's control. A static quota-and-tariff agreement therefore tends to collapse when a shock occurs, such as a landfill closure or a tonnage surge. Second, an instrument that compels supply through sanctions or put-or-pay penalties without verifying physical capacity shifts the cost of systemic failure onto the district budget. Article 10(1) of Law No. 30 of 2014 codifies the general principles of good governance (*asas-asas umum pemerintahan yang baik*, AUPB), including accuracy (*asas kecermatan*) and legal certainty, and courts apply proportionality as a further principle under Article 10(2).[30]

---

[26] Undang-Undang Nomor 18 Tahun 2008 tentang Pengelolaan Sampah [Law No. 18 of 2008 on Waste Management], arts. 9(1) and 26.

[27] Processed from Table 1, E3, E4, and E8. On cumulative intake for 2019–2023 (144,923.69 tonnes), see Fitria Rizky Maylana et al., "Analisis Sisa Umur Pakai TPA Regional Banjarbakula Tanpa Diterapkannya Upaya Pemilahan Sampah Residu," *EnviroScienteae* 20, no. 3 (2024): 253–67, https://doi.org/10.20527/es.v20i3.20262.

[28] Studi Kelayakan (Feasibility Study) TPA Regional Banjarbakula (Banjarmasin: Pemerintah Provinsi Kalimantan Selatan, 2023).

[29] Table 1, E3–E4.

[30] Undang-Undang Nomor 30 Tahun 2014 tentang Administrasi Pemerintahan [Law No. 30 of 2014 on Government Administration], art. 10(1)–(2). On proportionality in Indonesian administrative adjudication, see Nazla Arliva Rahman, Ratih Damayanti, and Rayi Kharisma Rajib, "Revolutionizing Indonesia's Administrative Court: A Bold Push for Fairness and Proportionality," *Indonesian State Law Review* 7, no. 1 (2025): 1–14, https://doi.org/10.15294/islrev.v7i1.18860. On abuse of authority under the same statute, see Ahmad Ahmad, "Analysis of Abuse of Authority by Government Apparatus in the State Administrative

Under these principles, a decision that imposes an obligation its addressee cannot factually perform rests on an incomplete assessment of the facts and distributes burdens disproportionately.

A voluntary, quota-based scheme thus tends to fail in a wetland ecosystem because ecoregional constraint inflates logistics costs beyond what a static agreement can absorb. Political will cannot cure that defect. The region needs a binding, adaptive inter-regional service-level agreement (SLA) that couples quota adjustment with a transparent, auditable formula for sharing hauling costs. Such an agreement should treat recurring disputes over fleet, weather, and roads as service risks rather than breaches of good faith. The law should also secure a graduated transition that keeps waste services running instead of enforcing the threshold prematurely.

Two objections deserve a response. The first holds that a mandatory regional cooperation agreement (*Kerja Sama Daerah*, KAD) would cure the problem. Compulsion, however, creates no trucks, roads, or bearing capacity; it only moves the point of failure to the budget least able to bear it. The second holds that the 1,000-tonne threshold is a reasonable proxy for economic viability. It is, but regions should reach it through an evidence-based transition rather than face it as an entry condition when their documented capacity is roughly a third of it. Read as a destination rather than a gate, the threshold keeps its efficiency rationale, and the AUPB turn a bare eligibility rule into a duty to sequence, verify, and protect service continuity.

Table 2. *Operational conditions of the Banjarbakula Regional Landfill (2024–2025)*

Aspect	Data/status	Implications for PSEL readiness and services	Source
Service area	Five regencies/cities (Banjarmasin, Banjarbaru, Banjar Regency, Barito Kuala, Tanah Laut)	Requires cross-regional coordination (KAD/SLA); prone to quota conflict during surges.	E3
Daily incoming volume	Average 350–400 tonnes/day; below 300 before the closure or revitalization of other landfills	Well below the ≥1,000 tonnes/day threshold; reinforces the need for a readiness test and realistic agglomeration.	E3, E4
Initial PKS quota	275 tonnes/day in total (Banjarmasin 105; Banjarbaru 90; Banjar Regency 60; Barito Kuala 10; Tanah Laut 10)	Static quotas do not adapt to shocks; they require adjustment and hauling-cost sharing.	E8 (via E3)
Realization (fluctuating)	Banjarmasin up to ±225; Banjar Regency up to ±100; Barito Kuala ±30; Banjarbaru broadly consistent; Tanah Laut not yet consistent	Rising tonnage without added infrastructure triggers overtime, landfill degradation, and dumping risk.	E3, E4
Heavy equipment	3 excavators (1 borrowed), 1 dozer, 1 loader	Equipment limits impede safe landfill operation, leachate management, and basic service before PSEL.	E3

Legal System," *International Journal of Constitutional and Administrative Law* 1, no. 1 (2025): 69–83, https://doi.org/10.66502/v2wdah74.

Aspect	Data/status	Implications for PSEL readiness and services	Source
Operational fuel	±5,000 L/month (2024), rising to >10,000 L/month (2025)	Hauling and operating costs surge; the legal focus shifts to proving the reasonableness of logistics costs.	E3, E4
2025 budget	APBD ±Rp 9 billion + BLUD ±Rp 2.7 billion (±Rp 11.7 billion)	Limited fiscal room for shocks; the BLUD can buffer procurement and contract flexibility.	E3
Readiness test (synthesis)	Input readiness, downstream-service readiness, and governance readiness (SLA, cost sharing, dispute mitigation)	Prevents coerced projects that cause service collapse and fiscal or administrative risk.	Authors' synthesis

Sources: E3 = UPTD presentation (2024–2025); E4 = UPTD field-findings summary (2025); E8 = PKS as recorded in E3. The final row presents the authors' synthesis, not data. *Abbreviations:* APBD = regional budget; BLUD = regional public-service agency; KAD = inter-regional cooperation (*Kerja Sama Daerah*); PKS = cooperation agreement (*Perjanjian Kerja Sama*); SLA = service-level agreement; TPA = final processing site (landfill).

3. Fiscal Asymmetry, Bureaucratic Behavior, and Legal Risk in Budgeting and Procurement

The regulation draws investment authority to the center but leaves regions with collection and hauling. Regions must also keep the landfill (*Tempat Pemrosesan Akhir*, TPA) and integrated processing sites (*Tempat Pengolahan Sampah Terpadu*, TPST) operating during the transition. The question is what follows when the law devolves the most volatile costs while the principal incentives stay at the center.

The Banjarbakula record shows fiscal pressure concentrating downstream. Fuel use roughly doubled between 2024 and 2025, unsorted intake strains the leachate plant, and the 2025 operating budget stood at about Rp 9 billion from the regional budget and Rp 2.7 billion from the regional public-service agency (*Badan Layanan Umum Daerah*, BLUD) (Table 2).[31] The regulation sharpens the point. The cooperation agreement must contain a *compensation* clause for supply below 1,000 tonnes, while PLN owes no take-or-pay penalty when output falls short because of technical problems beyond the entity's control or inadequate regional supply.[32] Supply-shortfall risk thus flows expressly to the regional budget, whereas the state cushions generation risk through a premium thirty-year offtake concentrated on priority cities.[33] By folding the former tipping fee into the PLN tariff, the regulation also relieves regions of processing costs; what it leaves them is the recurring cost of collection, hauling, and downstream service, which each region must meet from its own budget.

Three legal points follow. First, a policy that devolves the most volatile costs and centralizes incentives without an explicit matrix of authority and cost binds a subordinate authority to costs it neither designed nor controls. That arrangement offends the

[31] Table 1, E3–E4.
[32] Presidential Regulation No. 109 of 2025, arts. 17(2)(e) and 19(6)(c).
[33] Presidential Regulation No. 109 of 2025, art. 19; "PLN Jamin Serap Seluruh Listrik PSEL Selama 30 Tahun"; "PLN Wajib Beli Listrik Pembangkit Sampah 20 Sen per kWh Tanpa Negosiasi"; "Ini Alasan Tarif Listrik PLTSa Naik Jadi US$20 Sen per kWh."

principles of accuracy and proportionality. Second, the problem concerns multi-level administrative due process. When a central decision directly affects regional budgets and services, due process requires verifiable data, auditable cost reasonableness, and a formal channel through which the region can submit technical facts (moisture, calorific value, landfill capacity, raw-water status) and question the technology chosen. Third, the practical danger is a defensive bureaucracy. Officials who face costs they cannot justify either avoid action or risk allegations of mark-up. The remedy is structural. Regions should keep separate cost accounts for collection, hauling, downstream strengthening, and residue, and tie each account to verifiable parameters such as distance, trip frequency, equipment productivity, and operating days. They should also maintain an audit trail of weighbridge manifests, fleet GPS data, trip logs, fuel standards, and price comparisons.[34] The BLUD can act as a lawful transitional buffer that contracts flexibly for equipment, maintenance, raw water, and leachate treatment while observing accountability and sound business practice.[35]

The stakes are also personal. Auditors can recast expenditure that no defensible standard supports as state financial loss, which exposes the commitment-making official and the treasurer to audit findings and, at worst, to anti-corruption proceedings.[36] Unit costs that rise with distance and swamp conditions look anomalous against national benchmarks unless a documented basis supports them. The audit trail therefore protects both the public purse, by making cost reasonableness testable, and the honest official, by turning a contestable judgment into a parameter-based decision. Because state financial loss must be actual and quantifiable, the same records also separate an ordinary overrun from a loss caused by an unlawful act. The answer to the second question is thus twofold. Fiscal asymmetry induces risk-averse budgeting and exposes officials to procurement risk. Separate accounts, unit-cost standards, proportional inter-regional compensation, and a matrix that states who decides, who pays, and against what measure give effect to legal certainty (*asas kepastian hukum*), accuracy, and proportionality.

4. Technology-Context Fit, Protection of the Regional Budget, and a Just Transition

On its face, the regulation is technology-neutral. It requires only that the selected technology be tested, current, and suited to the waste. Yet it defines PSEL as a plant that converts waste into electricity while significantly reducing its volume, and it classifies biological routes such as biomass and biogas separately as bioenergy.[37] At 1,000 tonnes per day, such a pathway is in practice thermal, and its established technology is the grate

[34] Undang-Undang Nomor 23 Tahun 2014 tentang Pemerintahan Daerah; Peraturan Pemerintah Nomor 28 Tahun 2018 tentang Kerja Sama Daerah.
[35] Peraturan Menteri Dalam Negeri Nomor 79 Tahun 2018 tentang Badan Layanan Umum Daerah.
[36] Undang-Undang Nomor 31 Tahun 1999 tentang Pemberantasan Tindak Pidana Korupsi, as amended by Undang-Undang Nomor 20 Tahun 2001; on the concept of state financial loss (*kerugian keuangan negara*) and its audit, see Undang-Undang Nomor 15 Tahun 2006 tentang Badan Pemeriksa Keuangan. On the requirement, following Constitutional Court Decision No. 25/PUU-XIV/2016, that state financial loss be actual and quantifiable rather than potential, see Achmad Faishal, Habib Shulton Asnawi, and Wan Abdul Rahim bin Wan Abd Aziz, "Corruption of People's Business Credit Funds as Part of White-Collar Crime in Indonesia," *Jambura Law Review* 8, no. 2 (2026): 645, https://doi.org/10.33756/jlr.v1i2.36241.
[37] Presidential Regulation No. 109 of 2025, arts. 1(6)–(7), 3, and 15(1)(a).

incinerator.[38] The legal question therefore has two parts. The first is whether a uniform design that channels every region into a thermal pathway at a fixed scale and tariff is defensible for the wet waste of a wetland ecoregion. The second is how the law should allocate the resulting technology-performance risk so that it falls neither on the regional budget nor on displaced informal workers.

World Bank guidance provides the benchmark. Waste fed to a grate incinerator should have a lower heating value (LHV) of at least 6 MJ/kg (about 1,430 kcal/kg) in every season and an annual average of at least 7 MJ/kg (about 1,670 kcal/kg) to burn without auxiliary fuel, and its moisture should stay below fifty percent.[39] Banjarbakula's waste falls far short. Its calorific value is roughly 900–1,100 kcal/kg in the dry season and near 800 kcal/kg in the rainy season, its moisture exceeds sixty percent, and food and organic matter dominate it (food waste around 52.7 percent; landfill organic fractions around 35.6 percent). The records also confirm that it is not residual waste (Table 3).[40] In a standard furnace, such waste spends the heat needed for the steam cycle on evaporating moisture. The chamber may then fail to reach the condition of roughly 850°C for two seconds that suppresses the formation of dioxins and furans.[41] Four legal consequences follow.

a. Environmental-Law Compliance

A furnace that cannot reliably hold the 850°C, two-second condition risks systematic breaches of the emission standards for thermal treatment. Applied without regard to feedstock, a thermal pathway therefore creates a standing compliance risk rather than a mere engineering inconvenience.[42]

[38] World Bank, *Municipal Solid Waste Incineration*, World Bank Technical Guidance Report (Washington, DC: World Bank, 1999), 9 and passim.
[39] World Bank, *Municipal Solid Waste Incineration*, 9, 12; GIZ, *Waste-to-Energy Options in Municipal Solid Waste Management: A Guide for Decision Makers in Developing and Emerging Countries* (Eschborn: GIZ, 2017), 21, 25; Hefa Cheng and Yuanan Hu, "Municipal Solid Waste (MSW) as a Renewable Source of Energy: Current and Future Practices in China," *Bioresource Technology* 101, no. 11 (2010): 3816–24, https://doi.org/10.1016/j.biortech.2010.01.040.
[40] Dinas Lingkungan Hidup Provinsi Kalimantan Selatan, *Laporan Neraca Massa Sampah Regional Banjarbakula Tahun 2024* (Banjarmasin: DLH Provinsi Kalimantan Selatan, 2024), 15; Feasibility Study, 45; Dinas Lingkungan Hidup Provinsi Kalimantan Selatan, *Laporan Uji Karakteristik Sampah TPA Regional* (Banjarbaru: UPT Laboratorium Lingkungan, 2023).
[41] Directive 2010/75/EU (Industrial Emissions Directive), art. 50(2); Peraturan Menteri Lingkungan Hidup dan Kehutanan Nomor P.70/MENLHK/SETJEN/KUM.1/8/2016 tentang Baku Mutu Emisi Usaha dan/atau Kegiatan Pengolahan Sampah secara Termal [Minister of Environment and Forestry Regulation No. P.70 of 2016]; Hefa Cheng and Yuanan Hu, "Curbing Dioxin Emissions from Municipal Solid Waste Incineration in China: Re-thinking about Management Policies and Practices," *Environmental Pollution* 158, no. 9 (2010): 2809–14, https://doi.org/10.1016/j.envpol.2010.06.014.
[42] Minister of Environment and Forestry Regulation No. P.70 of 2016; Cheng and Hu, "Curbing Dioxin Emissions," 2809–14.

b. Proportionality in Application

The defect lies in proportionality in application, not in facial invalidity. The four-limb analysis elaborated by Alexy and Barak offers a useful structure.[43] Indonesian courts have not adopted it as formal doctrine, but it gives content to the principles of accuracy and proportionality that Indonesian administrative law recognizes. The aim of accelerating waste-to-energy investment is legitimate. Channeling wet waste into a thermal pathway, however, fails the *suitability* limb, because the plant cannot function well without substantial auxiliary fuel. Article 15(1)(a) requires technology suited to the waste, yet the regulation provides no procedure for testing that suitability against a region's actual feedstock before committing the region.

On *necessity*, the regulation itself supplies much of the answer. Article 3 recognizes bioenergy, renewable liquid fuel, and by-product pathways alongside PSEL, and international guidance regards biological treatment and landfill-gas recovery as better suited than incineration to wet, high-organic waste in lower-income settings.[44] The record does not show that these alternatives cost less at 350–400 tonnes per day, and the article makes no such claim. The defect lies in procedure. The readiness prerequisites admit a region to the thermal pathway without any comparative appraisal of the pathways the regulation recognizes, and a measure adopted without examining less burdensome alternatives that the norm itself contemplates cannot be shown to be necessary. The design also fails *proportionality in the narrow sense*, because the region bears the fiscal risk while the benefit accrues at the center.

Four characterizations must remain separate: (i) a potential conflict with higher statutes, namely the ecoregion mandate of Law No. 32 of 2009 and the basic-service duties of Law No. 23 of 2014 and Law No. 18 of 2008, which the Supreme Court, not the Constitutional Court, must test because a Presidential Regulation is subordinate legislation; (ii) a risk of maladministration where implementation lacks an adequate factual basis; (iii) an as-applied, disproportionate fiscal burden; and (iv) a policy-design choice for policy evaluation. The Constitutional Court's natural-resource jurisprudence informs the narrow-proportionality assessment, but only for what the Court decided. In Decision No. 3/PUU-VIII/2010 on the coastal-concession (HP-3) regime, the Court measured "the greatest prosperity of the people" under Article 33(3) by four benchmarks: the resource's benefit to the people, the equitable distribution of that benefit, popular participation in determining it, and respect for inherited rights.[45] The case concerned coastal concessions,

---

[43] Robert Alexy, *A Theory of Constitutional Rights*, trans. Julian Rivers (Oxford: Oxford University Press, 2002), 66–69; Aharon Barak, *Proportionality: Constitutional Rights and Their Limitations* (Cambridge: Cambridge University Press, 2012), 245–370 (chs. 9–12); on the Constitutional Court's only partial use of the test, see Tanto Lailam, Putri Anggia, and Muhammad Lutfi Chakim, "The Proportionality Test Models of Competing Rights Cases in the Civil and Common Law Systems: Lesson to Learn for Indonesia," *Hasanuddin Law Review* 10, no. 2 (2024): 206–25, https://doi.org/10.20956/halrev.v10i2.4844.

[44] Presidential Regulation No. 109 of 2025, art. 3; World Bank, *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050* (Washington, DC: World Bank, 2018), 105, table 5.3 (capital expenditure of US$600–1,000 per annual tonne for incineration in Europe, against US$345–600 for anaerobic digestion), https://doi.org/10.1596/978-1-4648-1329-0; UNEP, *Global Waste Management Outlook 2024*.

[45] Mahkamah Konstitusi Republik Indonesia, Putusan Nomor 3/PUU-VIII/2010 tentang Pengujian Undang-Undang Nomor 27 Tahun 2007 tentang Pengelolaan Wilayah Pesisir dan Pulau-Pulau Kecil (Jakarta: MKRI, 2011); on the four benchmarks, see Faiq Tobroni, "Mengkritisi HP-3 Perspektif Konstitusi dan

not the affordability of services. Its distributive and participatory benchmarks still matter, because a uniform design strains exactly those benchmarks when benefits accrue centrally, burdens settle regionally, and the burdened region has no voice. The regulation is therefore not "conditionally unconstitutional."[46] Applied uniformly without an ecoregion exception, however, it is vulnerable to judicial review for conflict with higher law and disproportionate in application.

Standing narrows the judicial route in practice. Article 31A(2) of Law No. 3 of 2009, the Second Amendment to the Supreme Court Law, grants standing to individual citizens, customary-law communities, and public or private legal entities whose rights a regulation injures, and Supreme Court Regulation No. 1 of 2011 implements that provision.[47] A regional government qualifies as a public legal entity, and an implementing regulation cannot narrow a statutory category. Its standing nonetheless remains insecure. The implementing regulation refers to a "community group or individual," and the region must show injury to its own right rather than a shifted administrative cost. Affected residents, waste-worker associations, or environmental organizations that frame their injury around basic services and a healthy environment make stronger petitioners. The removal of the former limitation period favors such challenges, but the rarity and length of proceedings make litigation a secondary remedy. The primary corrective belongs in regulatory design.

The case for a uniform national design is not frivolous. Standardization lowers transaction costs, simplifies oversight, and reassures investors, whereas exceptions invite regulatory arbitrage. That objection shapes the derogation clause but does not defeat it. A standard that an ecoregion cannot physically meet is not enforced there at all; it becomes a fiscal penalty on the region and a latent environmental risk.

c. Allocation of Technology-Performance Risk

Contract law should allocate technology-performance risk rather than moralize about it, and Indonesian law already supplies the governing principle. Presidential Regulation No. 38 of 2015 on public-private partnership (*Kerja Sama Pemerintah dengan Badan Usaha*, KPBU) makes risk management a governing principle and requires every KPBU

Pemberdayaan Rakyat (Kontribusi Teori Sosiologi Membaca Putusan Nomor 3/PUU-VIII/2010)," *Jurnal Konstitusi* 9, no. 2 (2012): 382–401, at 397; see also Mahkamah Konstitusi Republik Indonesia, Putusan Nomor 001-021-022/PUU-I/2003 tentang Pengujian Undang-Undang Nomor 20 Tahun 2002 tentang Ketenagalistrikan (Jakarta: MKRI, 2003), 334.

[46] Conditional unconstitutionality (*konstitusional bersyarat*) is a remedial technique that the Constitutional Court applies in the review of statutes. On the reach of that Court's remedial power, see Novendri M. Nggilu et al., "Abusive Constitutional Court: Dysplasia and the Destructive Power of Constitutional Court Decisions," *Estudios Constitucionales* 22, no. 2 (2024), https://estudiosconstitucionales.utalca.cl/index.php/home/article/view/188; on the gaps in Indonesia's judicial-review architecture, see Novendri M. Nggilu et al., "The Absence of Judicial Review on Constitutional Amendments in Indonesia: Urgency and Legal Reform for Constitutional Safeguards," *Journal of Law and Legal Reform* 6, no. 2 (2025): 659–92, https://doi.org/10.15294/jllr.v6i2.20888.

[47] Undang-Undang Nomor 3 Tahun 2009 tentang Perubahan Kedua atas Undang-Undang Nomor 14 Tahun 1985 tentang Mahkamah Agung, art. 31A(2) and (10); Peraturan Mahkamah Agung Nomor 1 Tahun 2011 tentang Hak Uji Materiil, arts. 1(4) and 2(1).

agreement to identify, mitigate, and allocate risk.[48] The official risk-allocation reference of PT Penjaminan Infrastruktur Indonesia assigns each risk to the party that holds the instruments to mitigate it.[49] Measured against that matrix, Presidential Regulation No. 109 of 2025 sits uneasily with Indonesia's own doctrine. The entity that selects, designs, and operates the technology is best placed to manage its performance, yet the readiness prerequisites shift the cost of underperformance to the regional budget.

The regulation itself contains the seeds of the correct allocation. Before selecting the business entity, Danantara must prepare a technical and economic study that covers waste volume and calorific value, the collection and transport systems, and the identification, mitigation, and allocation of risk. It may select only a participant whose technology is "suited to the type of waste to be processed."[50] A fitness-for-purpose warranty gives that criterion contractual form, and the readiness test supplies the data that the study requires. The proposal thus applies an existing principle to a risk that the new scheme left unallocated.[51] The contract should not frame that risk as "strict liability." In Indonesian environmental law, that term denotes the absolute liability (*tanggung jawab mutlak*) that Article 88 of Law No. 32 of 2009, as amended by Law No. 6 of 2023 on Job Creation, attaches to activities involving hazardous substances or hazardous waste, and it is a doctrine of tort. The contract should instead use a *fitness-for-purpose warranty* backed by an *acceptance test*, a *measurement-and-verification protocol*, and *performance security*, and it should exclude feedstock incompatibility from force majeure. A threshold set at the rainy-season value would be triggered, and contested, in precisely the conditions it governs, so the warranted specification must reflect the seasonal distribution of the feedstock. In substance, the agreement can provide as follows:

> **Article X. Technology Fitness-for-Purpose Warranty, Acceptance Testing, and Allocation of Performance Risk**
>
> (1) Before financial close, an independent laboratory appointed jointly by the parties shall conduct a twelve-month feedstock characterization campaign covering both the wet and the dry season, sampling at the weighbridge at the frequency and by the method set out in Schedule A. The Feedstock Design Envelope is the range of lower heating value and moisture content within which at least ninety percent of the samples fall (P90).
>
> (2) The Implementing Business Entity warrants that the selected technology will achieve the agreed throughput, availability, and emission performance across the entire Feedstock Design Envelope without additional operational cost to the regional government.

[48] Peraturan Presiden Nomor 38 Tahun 2015 tentang Kerja Sama Pemerintah dengan Badan Usaha dalam Penyediaan Infrastruktur, arts. 4(d), 30(2)(e), and 32(2)(e).
[49] PT Penjaminan Infrastruktur Indonesia, *Acuan Alokasi Risiko KPBU di Indonesia* (Jakarta: PT PII, 2017).
[50] Presidential Regulation No. 109 of 2025, arts. 14(2)–(3) and 15(1)(a).
[51] Timothy C. Irwin, *Government Guarantees: Allocating and Valuing Risk in Privately Financed Infrastructure Projects* (Washington, DC: World Bank, 2007); Organisation for Economic Co-operation and Development, *Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships* (Paris: OECD, 2012); on the risks specific to PPP waste-to-energy incineration, see Jinbo Song et al., "Risk Identification for PPP Waste-to-Energy Incineration Projects in China," *Energy Policy* 61 (2013): 953–62, https://doi.org/10.1016/j.enpol.2013.06.041.

(3) Commercial operation is subject to an acceptance test conducted during the wet season, including continuous verification of the 850°C, two-second combustion condition. Processing-related payment obligations commence only upon a successful acceptance test.

(4) The independent laboratory shall measure and verify performance monthly under the measurement-and-verification protocol in Schedule B, which specifies who samples, how often, and by what method. Its results bind the parties save for manifest error.

(5) Shortfalls against the warranted performance give rise to liquidated damages or availability-payment deductions calculated under Schedule C. The Implementing Business Entity bears the cost of any auxiliary fuel required to treat feedstock within the Envelope.

(6) Operational failure attributable to non-conformity between the technology's design and feedstock within the Envelope does not constitute force majeure and does not discharge the Entity's obligations.

On present data (Table 3), the Envelope would extend below about 800 kcal/kg and above sixty percent moisture, but the clause leaves the exact bounds to the characterization campaign. Its enforceability does not rest on freedom of contract under Article 1338 of the Civil Code, which procurement and partnership rules substantially constrain in public-private instruments. It rests on the risk-allocation principle that the partnership framework mandates and on international practice on availability payments, performance guarantees, and deductions. The clause also applies the precautionary principle to public funds and gives the commitment-making official a firm basis for rejecting cost claims that stem from the implementer's own underperformance.[52]

One difficulty remains. The region is a party to the cooperation agreement, but it has no say in choosing its counterparty, because Danantara selects the business entity under centrally set criteria.[53] Bound to a partner and a technology it did not choose, while bearing the Article 4 obligations, the region has contractual capacity without bargaining power. The recommendation therefore addresses the central government, which should prescribe the warranty and the acceptance test as standard clauses in the technical guidelines and the model cooperation agreement. The region can supplement them through the conditions it attaches to its statement of readiness and through the inter-regional agreement among supplying regions.

d. Informal Workers and Non-Retrogression

The disproportion extends beyond the regional budget. At the Banjarbakula landfill, informal recyclers have long recovered plastics, metals, and paper, and closed, capital-intensive incineration would displace them without an alternative. The legal route runs through Article 6 of the International Covenant on Economic, Social and Cultural Rights

[52] Irwin, *Government Guarantees*; OECD, *Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships*; Song et al., "Risk Identification," 953–62; Undang-Undang Nomor 32 Tahun 2009, art. 88, as amended by Undang-Undang Nomor 6 Tahun 2023 tentang Penetapan Peraturan Pemerintah Pengganti Undang-Undang Nomor 2 Tahun 2022 tentang Cipta Kerja menjadi Undang-Undang.
[53] Presidential Regulation No. 109 of 2025, arts. 5(1)(a), 14(1), 15(1), and 17(1).

as construed in General Comment No. 18. The Committee there recognizes a strong presumption against retrogressive measures affecting the right to work, so removing a livelihood without an alternative is prima facie retrogressive and the state must justify it.[54] The record does not count the landfill's waste pickers, and establishing that baseline therefore belongs to the governance limb of the readiness test. The contract can require the implementer to build an upstream material recovery facility that employs waste pickers formally. Brazil recognizes this model by treating waste pickers as environmental service providers, and negotiators of a global plastics treaty now debate it as a just-transition obligation.[55]

The answer to the third question follows. The law protects the regional budget best at the contractual stage, through a clear division of responsibility. The region funds collection and hauling, and the implementer bears processing-performance risk through a warranty and an acceptance test defined over the seasonal feedstock envelope, so that "the waste is too wet" cannot justify higher local costs. PSEL should operate as a conditional option whose full implementation depends on a readiness test of input, logistics, and downstream capacity. Where an ecoregion cannot meet the uniform standard, a bounded derogation clause should permit evidence-based adjustment, and the transition should include a social-inclusion obligation toward displaced workers.

The proposal needs no new institution. The regulation already requires the region to submit a statement of readiness to the Minister of Environment, with proof that it meets the Article 4 criteria, evidence that regional planning documents include the plant, and a record of public consultation. The Minister then verifies the statement with the Ministers of Home Affairs and Energy.[56] Because the regulation sets no parameters for that verification, it risks becoming a mere completeness check. The readiness test supplies measurable content (input adequacy, logistical feasibility on the actual route, and downstream capacity), so that a region enters the scheme when it can perform rather than when it declares that it can.

[54] International Covenant on Economic, Social and Cultural Rights (1966), art. 6; Committee on Economic, Social and Cultural Rights, General Comment No. 18: The Right to Work (Article 6), UN Doc. E/C.12/GC/18 (February 6, 2006), paras. 21 and 34; see generally International Labour Organization, *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All* (Geneva: ILO, 2015).

[55] Sonia Maria Dias, "Waste Pickers and Cities," *Environment and Urbanization* 28, no. 2 (2016): 375–90, https://doi.org/10.1177/0956247816657302; Jutta Gutberlet and Sebastián Carenzo, "Waste Pickers at the Heart of the Circular Economy: A Perspective of Inclusive Recycling from the Global South," *Worldwide Waste* 3, no. 1 (2020): 6, https://doi.org/10.5334/wwwj.50; Patrick O'Hare and Taylor Cass Talbott, "Just Transition for Waste Pickers in the Global Plastics Treaty: What Is It and Why Is It Important?" *Cambridge Prisms: Plastics* 3 (2025): e26, https://doi.org/10.1017/plc.2025.10021.

[56] Presidential Regulation No. 109 of 2025, arts. 8(1)–(2), 12, and 13(1); Kementerian Lingkungan Hidup/Badan Pengendalian Lingkungan Hidup, "Sosialisasi Implementasi Peraturan Presiden Nomor 109 Tahun 2025 tentang Pengolahan Sampah Menjadi Energi Listrik (PSEL)," online recording, 2025, https://www.youtube.com/watch?v=k58a5Yqd2Ik (Table 1, E2).

Table 3. *Technical and logistical disparities in the Banjarbakula wetland ecosystem*

Technical variable	Benchmark and its legal status	Field finding (Banjarbakula)	Deviation/implication
Calorific value (LHV)	≥6 MJ/kg in every season and ≥7 MJ/kg annual average (≈1,430–1,670 kcal/kg); technical reference (a)	900–1,100 kcal/kg (dry season); ~800 kcal/kg (rainy season) (b)	Incompatible; risk that self-sustaining combustion fails.
Moisture content	<50% for combustion without auxiliary fuel; technical reference (a)	>60% (wet-waste characteristic) (b)	Requires substantial pre-treatment (drying).
Combustion condition	≥850°C for ≥2 seconds; reference standard (c)	Not yet tested (no plant); at risk under wet feed	Emission-compliance risk; the acceptance test must take place in the wet season.
Feedstock supply	≥1,000 tonnes/day, with inter-regional agglomeration possible; existing legal requirement (d)	±350–400 tonnes/day (2025) (e)	Readiness gap of ±600 tonnes/day; idle-capacity risk; graduated transition needed.
Hauling cost	Existing (d): regional budget bears collection and hauling. Proposed: evidence-based, auditable unit cost (tonne-km), shared through the SLA	Fuel ±5,000 L/month (2024) to >10,000 L/month (2025); variable fleet and distance (e)	Cost-overrun and procurement/legal risk; needs hauling-cost standards and oversight.
Downstream facilities (TPA/TPST)	Proposed: adequate equipment, raw water, leachate treatment, and SOPs as prerequisites	Limited equipment; raw water not yet available (drilling planned); leachate plant under strain (e)	Risk of service collapse and dumping if supply is pursued before infrastructure is strengthened.

Sources: (a) World Bank, *Municipal Solid Waste Incineration* (1999), 9 (calorific value) and 12 (moisture <50%, ash <60%, combustibles >25% for combustion without auxiliary fuel); cf. GIZ, *Waste-to-Energy Options in Municipal Solid Waste Management* (2017), 21. (b) Waste Characteristics Test Report (E6); Mass Balance Report (E5), 15. (c) Directive 2010/75/EU, art. 50(2); for Indonesian thermal-treatment emission standards, see Minister of Environment and Forestry Regulation No. P.70 of 2016. (d) Presidential Regulation No. 109 of 2025, art. 4(1). (e) UPTD presentation and summary (E3–E4). Rows marked "Proposed" state the standard this article recommends, not an existing legal requirement. *Abbreviations:* LHV = lower heating value; SLA = service-level agreement; SOP = standard operating procedure; TPA = final processing site (landfill); TPST = integrated waste-processing site.

Comparative Lessons and the Design of an Ecological Derogation Clause

1. China, the Philippines, and Malaysia

Three contrasting jurisdictions sharpen the research questions. The comparison follows the three criteria set out in the Methods section and serves to locate Indonesia's choices, not to transplant foreign rules.

Centralization of investment. China anchors large-scale waste-to-electricity in centralized supply-chain planning and public-private partnership financing, and it administers subsidies and offtake as instruments of that plan. The model works because the state

controls both investment and the upstream supply chain.[57] The record is nonetheless mixed. Rapid expansion brought persistent difficulty in controlling dioxin emissions, which Cheng and Hu attribute to management practices that lagged behind capacity, and comparative reviews still place China's emission limits behind European practice.[58] The defensible lesson is narrower. Centralized investment solved the financing constraint without solving feedstock quality or emission compliance, the same gap this article finds in Indonesia. Indonesia adopts the investment half of the Chinese model through Danantara and the offtake obligation but leaves the supply half, collection and hauling, with the regions. Without central control of the input chain, service-level agreements, cost-sharing based on distance and tonnage, and downstream strengthening must substitute for it.

Posture toward incineration. The Philippines occupies the opposite pole. Section 20 of the Clean Air Act (Republic Act No. 8749) bans the incineration of municipal, biomedical, and hazardous waste, and the Ecological Solid Waste Management Act (Republic Act No. 9003) builds waste management around reduction, segregation, and local planning. Thermal waste-to-energy survives only in the space that the Supreme Court left in *MMDA v. Jancom Environmental Corporation*, which read the ban as reaching only processes that emit poisonous and toxic fumes.[59] Two lessons follow. First, a legal order can treat incineration as a disfavored option hedged by strict emission conditions. Because Indonesia's PSEL pathway is in practice thermal, Indonesia carries a heavier burden to guarantee the 850°C, two-second condition with wet waste. The Philippines, which has organized its waste system around non-thermal pathways for a quarter century, also supports the necessity analysis above. Second, a prohibitory statute does not execute itself. Republic Act No. 9003 places primary responsibility on local government units,[60] and where local capacity falls short, its preference for segregation depends on resources the statute does not supply. Neither a technology mandate nor a technology ban succeeds without the input and service capacity to support it.

Malaysia and the ASEAN dimension. Malaysia is a federation and Indonesia a unitary state, but both must apply national waste policy across regions that differ in ecology, infrastructure, finance, and institutional capacity. Malaysia's Solid Waste and Public Cleansing Management Act 2007 (Act 672) sought uniformity by moving regulatory responsibility to the federal level and licensing waste services and facilities.[61] Its application remains uneven; Sabah, for example, has enacted its own Solid Waste and Public Cleansing Management Enactment 2022.[62] Centralization improved coordination without erasing local differences. Malaysian studies likewise treat WtE as one landfill

[57] Shen et al., "Impact of Environmental Regulation on Government Subsides," 1288851; Cheng and Hu, "Municipal Solid Waste (MSW) as a Renewable Source of Energy," 3816–24.
[58] Cheng and Hu, "Curbing Dioxin Emissions," 2809–14; Isla Hodgkinson et al., "Mini-Review of Waste-to-Energy Related Air Pollution and Their Limit Value Regulations in an International Comparison," *Waste Management & Research* 40, no. 7 (2022): 849–58, https://doi.org/10.1177/0734242X211060607.
[59] Republic Act No. 8749, sec. 20; Republic Act No. 9003; *MMDA v. Jancom Environmental Corporation*, G.R. No. 147465.
[60] Republic Act No. 9003, sec. 10.
[61] Malaysia, Solid Waste and Public Cleansing Management Act 2007 (Act 672).
[62] Sabah, Solid Waste and Public Cleansing Management Enactment 2022; see Haidy Henry Dusim, "Toward Sustainable Waste Management: Assessing the Potential Implications of Sabah's Solid Waste and Public Cleansing Management Enactment 2022," *Journal of Administrative Science* 22, no. 2 (2025): 253–66.

alternative among several, whose viability depends on environmental, financial, technical, and social factors, including waste composition, and they compare incineration, anaerobic digestion, gasification, and landfill-gas recovery.[63] Bong and colleagues show that biogas development depends on segregation, collection, incentives, and technical support, and later work documents rising management costs and the role of alternative treatment.[64] Under the Environmental Quality Act 1974 and its Environmental Impact Assessment Order 2015, a national preference for WtE does not establish that a given facility suits a given site; regulators decide that question project by project.[65] The incentives of the Renewable Energy Act 2011 do not make a project suitable by themselves either.[66] Technology selection, in short, should follow the readiness of the waste system.

Allocation of fiscal risk. In all three systems, fiscal risk follows control. Where the center plans and finances the supply chain, it internalizes the risk; where local units carry service duties, the risk settles on them. China shows that centralization works when control over investment matches control over the input chain. The Philippines shows that a strong legal posture fails without subnational capacity, and Malaysia shows that regulatory centralization improves consistency without removing local differences. Indonesia meets neither of the first two conditions. It centralizes investment without controlling the supply chain, and it channels regions into a thermal pathway without guaranteeing their capacity. The lesson is to align risk with control through an input-based readiness test, an ecoregion-based derogation clause, and the allocation of technology-performance risk to the party that selects and operates the technology. The ASEAN Framework for Circular Economy sets common objectives on resource efficiency, green technology, and sustainable finance,[67] but common objectives do not require identical implementation. The comparison thus supports conditional harmonization, in which uniform policy does not entail uniform technology.

2. Operationalizing the Ecological Derogation Clause

A new legal instrument must be capable of drafting, application, and review. The ecological derogation clause is therefore a controlled mechanism, not a general exemption from national WtE policy. It adjusts implementation where objective evidence shows that ecological, infrastructural, or waste conditions make the national approach unsuitable, and six elements give it legal form (Table 4). *Legal vehicle.* Under Law No. 12 of 2011, as amended, a Presidential Regulation contains material ordered by statute,

[63] Zi Jun Yong et al., "Sustainable Waste-to-Energy Development in Malaysia: Appraisal of Environmental, Financial, and Public Issues Related with Energy Recovery from Municipal Solid Waste," *Processes* 7, no. 10 (2019): 676, https://doi.org/10.3390/pr7100676.

[64] Cassendra Phun Chien Bong et al., "Review on the Renewable Energy and Solid Waste Management Policies towards Biogas Development in Malaysia," *Renewable and Sustainable Energy Reviews* 70 (2017): 988–98, https://doi.org/10.1016/j.rser.2016.12.004; Norhani Aripin et al., "Sustainable Solid Waste Management in Malaysia: Overview of Costing and Incentives," *paperASIA* 40, no. 5b (2024): 113–25, https://doi.org/10.59953/paperasia.v40i5b.194.

[65] Malaysia, Environmental Quality Act 1974 (Act 127); Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, P.U.(A) 195/2015.

[66] Malaysia, Renewable Energy Act 2011 (Act 725).

[67] ASEAN Secretariat, *Framework for Circular Economy for the ASEAN Economic Community* (Jakarta: ASEAN Secretariat, 2021).

material implementing a Government Regulation, or material for the exercise of governmental power.[68] Because Presidential Regulation No. 109 of 2025 itself fixes the readiness criteria (art. 4(1)), only an amendment can insert the derogation. A Ministerial Regulation may set technical parameters but cannot relax criteria that a higher instrument fixes. *Decision-maker and procedure.* The Minister of Environment, together with the Ministers of Home Affairs and Energy, would decide at the existing verification stage (arts. 8, 12, and 13(1)) on a reasoned application attached to the statement of readiness. *Evidentiary threshold.* The applicant must submit a twelve-month, two-season feedstock characterization by an independent laboratory, a route-specific logistics study expressed in cost per tonne-kilometer, and an independently verified audit of equipment, raw water, and leachate capacity. It must also show that reasonable measures cannot meet the uniform standard within the transition period, because cost alone does not suffice. *Scope and floor.* A derogation may adjust means: the technology pathway (including the non-thermal pathways of Article 3), pre-treatment, the timing of the threshold, the agglomeration radius, cost-sharing, and the implementation period. It may never relax emission or environmental-quality standards, which form a fixed floor under the principle of non-regression.[69] *Duration and review.* A derogation runs for a fixed term and lapses unless renewed on fresh verification. As a written administrative decision, it enters a public register with its evidence and remains reviewable by the State Administrative Court.[70]

These safeguards also answer the "race to the bottom" objection. That thesis is itself contested,[71] but the clause does not depend on the debate. Physical evidence, not competition for investment, triggers the derogation. The policy's ends and the environmental floor stay fixed, and every derogation is reasoned, published, time-limited, and reviewable. A region that obtains a derogation gains no investment advantage; it accepts a slower or different pathway. So bounded, the derogation lets national policy respond to conditions that legislation cannot make uniform.

***Table* 4.** *Operational design of the ecological derogation clause*

Element	Design	Legal anchor
Legal vehicle	Amendment of Presidential Regulation No. 109 of 2025; technical parameters set by Ministerial Regulation; terms reflected in the model PSEL agreement and the inter-regional agreement	Law No. 12 of 2011, as amended, art. 13; Presidential Regulation No. 109 of 2025, art. 4(1)

[68] Undang-Undang Nomor 12 Tahun 2011 tentang Pembentukan Peraturan Perundang-undangan, as amended by Undang-Undang Nomor 15 Tahun 2019 and Undang-Undang Nomor 13 Tahun 2022, art. 13. On how statutes, parliamentary rules, and judicial decisions, rather than constitutional text alone, determine whether a legal design can be operated, see Rahmat Mokodompit, "Infrastructural Rigidity: Formal Amendment in Indonesia, the Philippines, and South Korea," *Journal of Constitutional Change* 1, no. 1 (2026): 72–92, https://doi.org/10.66502/ryz35895.

[69] Michel Prieur, "Non-regression in Environmental Law," *S.A.P.I.EN.S* 5, no. 2 (2012); Minister of Environment and Forestry Regulation No. P.70 of 2016.

[70] Law No. 30 of 2014, arts. 10 and 87; Undang-Undang Nomor 5 Tahun 1986 tentang Peradilan Tata Usaha Negara, as last amended by Undang-Undang Nomor 51 Tahun 2009.

[71] Richard L. Revesz, "Rehabilitating Interstate Competition: Rethinking the 'Race-to-the-Bottom' Rationale for Federal Environmental Regulation," *New York University Law Review* 67 (1992): 1210–54; Esty, "Revitalizing Environmental Federalism," 570–653.

Element	Design	Legal anchor
Decision-maker	Minister of Environment with the Ministers of Home Affairs and Energy, at readiness verification, on a reasoned application attached to the region's statement of readiness	Presidential Regulation No. 109 of 2025, arts. 8, 12, and 13(1)
Evidentiary threshold	Twelve-month, two-season feedstock characterization; route-specific tonne-km logistics study; downstream-capacity audit; independent verification; cost alone insufficient	Accuracy principle, Law No. 30 of 2014, art. 10(1)
Scope and floor	Means adjustable (pathway, pre-treatment, threshold timing, agglomeration radius, cost sharing, period); emission and environmental-quality standards never adjustable	Presidential Regulation No. 109 of 2025, art. 3; Regulation P.70 of 2016; non-regression principle
Duration	Fixed term aligned with the transition; automatic lapse; renewal only on fresh verification	Legal-certainty principle, Law No. 30 of 2014, art. 10(1)
Review and transparency	Written, reasoned decision; public register; annual reporting; review before the State Administrative Court	Law No. 30 of 2014, arts. 10 and 87; Law No. 5 of 1986, as amended

Source: Authors' design, drawing on the legal instruments cited in the table.

3. Toward an Administrable Transition

Together, the three answers point to an administrable transition. A transition phase of twelve to twenty-four months should carry output indicators: a smaller unmanaged organic fraction through sorting and TPST strengthening, a restored minimum stock of heavy equipment, completed leachate and raw-water works, and better weighbridge and trip records. Two instruments add discipline. The first is a distance-time parameter, such as a radius under fifty kilometers or one hour, recalculated for swamp conditions and applied before any expansion of the catchment. The second is a dispute ladder that runs from technical clarification to inter-regional mediation and, if necessary, a dispute board. The readiness test belongs in technical guidelines, the derogation in the amendment, and the warranty in the model PSEL agreement.

4. Counter arguments and Limitations

Three objections and the study's limits deserve acknowledgment. The first objection calls this an implementation problem rather than a legal one. Administrative law, however, operates precisely at the line between design and implementation: a norm that imposes an obligation it has not made performable, and shifts the cost to a subordinate authority, engages proportionality and accuracy. The second objection warns of judicial or bureaucratic overreach, yet the instrument asks only that a subordinate regulation conform to higher statutes and that decisions affecting local budgets meet existing procedural discipline. The third objection, that one case cannot support general claims, marks the principal limitation. Banjarbakula is a critical case in which the mechanism is unusually legible, and transferability remains a hypothesis. Independent measurement would strengthen the official figures, and the article omits a comparative hauling-cost figure because no source disclosed its calculation. Without a matched non-wetland comparator, the study cannot separate the cost of wetland geography from that of general underdevelopment. The thermodynamic evidence escapes that objection, but the

logistical evidence does not. The comparison is doctrinal and excludes Vietnam and Thailand, whose feedstock has similar moisture; Malaysia better isolates the question because of its federal centralization statute and uneven application. These limits narrow the study's reach without disturbing its central claim about the relationship between a norm and the conditions of its own applicability.

Conclusion

This article asked how Presidential Regulation No. 109 of 2025 operates in the wetland setting of Banjarbakula. First, voluntary, quota-based inter-regional cooperation cannot secure supply in a wetland ecoregion. Distance, road bearing capacity, fleet, and travel time lie beyond any single region's control, and the peat substrate aggravates them; even with institutionalized agglomeration, intake remains at about a third of the threshold. Service continuity therefore requires a binding, adaptive service-level agreement with an auditable cost-sharing formula and a graduated transition, not sanctions. Second, centralized investment that remains uncoupled from the supply chain settles the most volatile costs on regional budgets, induces risk-averse budgeting, and exposes officials to procurement and anti-corruption risk. Separate cost accounts, an auditable expenditure trail, a transitional BLUD buffer, and a multi-level due-process duty provide the corrective. Third, a uniform design that channels wet, low-calorific waste into a thermal pathway is not unconstitutional, but applied without exception it is open to Supreme Court review for conflict with higher statutes and is disproportionate in application. The legal answer combines a readiness test, an ecological derogation clause bounded by evidence, time, publication, review, and a non-regression floor, a centrally prescribed fitness-for-purpose warranty, and a social-inclusion obligation toward displaced waste pickers.

The article's theoretical contribution is to treat ecoregional constraint as a legally operative condition. Using a weak sense of geographic determinism, it shows that a physical condition can fix the envelope within which a national norm may lawfully demand performance. It grounds territorial differentiation in a unitary state in the constitutional recognition of regional specificity rather than in federalism. European derogations relax environmental protection to accelerate renewables; this derogation relaxes a renewable mandate to protect ecological and fiscal reality. For ASEAN, the comparison suggests that uniform policy need not mean uniform technology.

The President should amend the regulation to insert the derogation clause and specify the parameters of readiness. The Minister of Environment, with the Ministers of Home Affairs and Energy, should issue readiness guidelines, decide on derogations, and keep a public register. Danantara and the model PSEL agreement should embed the warranty, the wet-season acceptance test, the verification protocol, and the social-inclusion obligation. The province should broker a service-level agreement with quota adjustment, tonne-kilometer cost-sharing, and a dispute ladder. Regional governments, the BLUD, and the UPTD should separate cost accounts, keep the audit trail, and establish environmental and social baselines, including the number of waste pickers. Future research should test the readiness test in peatland, archipelagic, and upland ecoregions, extend the comparison to Vietnam and Thailand, and assess the regulation once plants begin operating.

References

Acemoglu, Daron, Simon Johnson, and James A. Robinson. "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution." *Quarterly Journal of Economics* 117, no. 4 (2002): 1231–94.

Ahmad, Ahmad. "Analysis of Abuse of Authority by Government Apparatus in the State Administrative Legal System." *International Journal of Constitutional and Administrative Law* 1, no. 1 (2025): 69–83. https://doi.org/10.66502/v2wdah74.

Alexy, Robert. *A Theory of Constitutional Rights*. Translated by Julian Rivers. Oxford: Oxford University Press, 2002.

Antara News. "PLN Jamin Serap Seluruh Listrik PSEL Selama 30 Tahun." July 16, 2026. https://www.antaranews.com/berita/5652081/pln-jamin-serap-seluruh-listrik-psel-selama-30-tahun.

Aripin, Norhani, Noor Afza Amran, Rokiah Ishak, and Hussaini Bala. "Sustainable Solid Waste Management in Malaysia: Overview of Costing and Incentives." *paperASIA* 40, no. 5b (2024): 113–25. https://doi.org/10.59953/paperasia.v40i5b.194.

ASEAN Secretariat. *Framework for Circular Economy for the ASEAN Economic Community*. Jakarta: ASEAN Secretariat, 2021.

Asshiddiqie, Jimly. *Green Constitution: Nuansa Hijau Undang-Undang Dasar Negara Republik Indonesia Tahun 1945*. Jakarta: Rajawali Pers, 2009.

Banakar, Reza, and Max Travers. *Theory and Method in Socio-Legal Research*. Oxford: Hart Publishing, 2005.

Barak, Aharon. *Proportionality: Constitutional Rights and Their Limitations*. Cambridge: Cambridge University Press, 2012.

Beach, Derek, and Rasmus Brun Pedersen. *Process-Tracing Methods: Foundations and Guidelines*. 2nd ed. Ann Arbor: University of Michigan Press, 2019.

Bisnis.com. "PLN Wajib Beli Listrik Pembangkit Sampah 20 Sen per kWh Tanpa Negosiasi." October 15, 2025. https://hijau.bisnis.com/read/20251015/652/1920551/pln-wajib-beli-listrik-pembangkit-sampah-20-sen-per-kwh-tanpa-negosiasi.

Bong, Cassendra Phun Chien, Wai Shin Ho, Haslenda Hashim, Jeng Shiun Lim, Chin Siong Ho, William Soo Peng Tan, and Chew Tin Lee. "Review on the Renewable Energy and Solid Waste Management Policies towards Biogas Development in Malaysia." *Renewable and Sustainable Energy Reviews* 70 (2017): 988–98. https://doi.org/10.1016/j.rser.2016.12.004.

Cheng, Hefa, and Yuanan Hu. "Curbing Dioxin Emissions from Municipal Solid Waste Incineration in China: Re-thinking about Management Policies and Practices." *Environmental Pollution* 158, no. 9 (2010): 2809–14. https://doi.org/10.1016/j.envpol.2010.06.014.

Cheng, Hefa, and Yuanan Hu. "Municipal Solid Waste (MSW) as a Renewable Source of Energy: Current and Future Practices in China." *Bioresource Technology* 101, no. 11 (2010): 3816–24. https://doi.org/10.1016/j.biortech.2010.01.040.

Committee on Economic, Social and Cultural Rights. General Comment No. 18: The Right to Work (Article 6 of the International Covenant on Economic, Social and Cultural Rights). UN Doc. E/C.12/GC/18. February 6, 2006.

Diamond, Jared. *Guns, Germs, and Steel: The Fates of Human Societies*. New York: W. W. Norton, 1997.

Dias, Sonia Maria. "Waste Pickers and Cities." *Environment and Urbanization* 28, no. 2 (2016): 375–90. https://doi.org/10.1177/0956247816657302.

Dinas Lingkungan Hidup Provinsi Kalimantan Selatan. *Laporan Neraca Massa Sampah Regional Banjarbakula Tahun 2024*. Banjarmasin: DLH Provinsi Kalimantan Selatan, 2024.

Dinas Lingkungan Hidup Provinsi Kalimantan Selatan. *Laporan Uji Karakteristik Sampah TPA Regional*. Banjarbaru: UPT Laboratorium Lingkungan, 2023.

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy (Water Framework Directive).

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on Industrial Emissions (Industrial Emissions Directive).

Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 (Renewable Energy Directive III).

Dusim, Haidy Henry. "Toward Sustainable Waste Management: Assessing the Potential Implications of Sabah's Solid Waste and Public Cleansing Management Enactment 2022." *Journal of Administrative Science* 22, no. 2 (2025): 253–66.

Esty, Daniel C. "Revitalizing Environmental Federalism." *Michigan Law Review* 95, no. 3 (1996): 570–653.

Faishal, Achmad, Habib Shulton Asnawi, and Wan Abdul Rahim bin Wan Abd Aziz. "Corruption of People's Business Credit Funds as Part of White-Collar Crime in Indonesia." *Jambura Law Review* 8, no. 2 (2026): 645–79. https://doi.org/10.33756/jlr.v1i2.36241.

Flyvbjerg, Bent. "Five Misunderstandings About Case-Study Research." *Qualitative Inquiry* 12, no. 2 (2006): 219–45.

GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit). *Waste-to-Energy Options in Municipal Solid Waste Management: A Guide for Decision Makers in Developing and Emerging Countries*. Eschborn: GIZ, 2017.

Gutberlet, Jutta, and Sebastián Carenzo. "Waste Pickers at the Heart of the Circular Economy: A Perspective of Inclusive Recycling from the Global South." *Worldwide Waste* 3, no. 1 (2020): 6. https://doi.org/10.5334/wwwj.50.

Hodgkinson, Isla, Roman Maletz, Franz-Georg Simon, and Christina Dornack. "Mini-Review of Waste-to-Energy Related Air Pollution and Their Limit Value Regulations in an International Comparison." *Waste Management & Research* 40, no. 7 (2022): 849–58. https://doi.org/10.1177/0734242X211060607.

Hoppe, Alexander, Michael Hübner, Sebastiaan Princen, and Martin Svec. "Adaptation, Experimentation or Conservation? The Use of Differentiated Implementation under the Energy Efficiency Directive." *JCMS: Journal of Common Market Studies* 63, no. 3 (2025): 745–64. https://doi.org/10.1111/jcms.13647.

Indonesia. *Keputusan Menteri Dalam Negeri Nomor 300.2.2-2138 Tahun 2025 tentang Pemberian dan Pemutakhiran Kode, Data Wilayah Administrasi Pemerintahan, dan Pulau*.

Indonesia. *Peraturan Mahkamah Agung Nomor 1 Tahun 2011 tentang Hak Uji Materiil*.

Indonesia. *Peraturan Menteri Dalam Negeri Nomor 79 Tahun 2018 tentang Badan Layanan Umum Daerah*.

Indonesia. *Peraturan Menteri Lingkungan Hidup dan Kehutanan Nomor P.70/MENLHK/SETJEN/KUM.1/8/2016 tentang Baku Mutu Emisi Usaha dan/atau Kegiatan Pengolahan Sampah secara Termal*.

Indonesia. *Peraturan Pemerintah Nomor 28 Tahun 2018 tentang Kerja Sama Daerah*.
Indonesia. *Peraturan Presiden Nomor 35 Tahun 2018 tentang Percepatan Pembangunan Instalasi Pengolah Sampah Menjadi Energi Listrik Berbasis Teknologi Ramah Lingkungan*.
Indonesia. *Peraturan Presiden Nomor 38 Tahun 2015 tentang Kerja Sama Pemerintah dengan Badan Usaha dalam Penyediaan Infrastruktur*.
Indonesia. *Peraturan Presiden Nomor 109 Tahun 2025 tentang Penanganan Sampah Perkotaan Melalui Pengolahan Sampah Menjadi Energi Terbarukan Berbasis Teknologi Ramah Lingkungan*.
Indonesia. *Undang-Undang Dasar Negara Republik Indonesia Tahun 1945*.
Indonesia. *Undang-Undang Nomor 2 Tahun 2024 tentang Provinsi Daerah Khusus Jakarta*.
Indonesia. *Undang-Undang Nomor 3 Tahun 2009 tentang Perubahan Kedua atas Undang-Undang Nomor 14 Tahun 1985 tentang Mahkamah Agung*.
Indonesia. *Undang-Undang Nomor 5 Tahun 1986 tentang Peradilan Tata Usaha Negara*, as last amended by *Undang-Undang Nomor 51 Tahun 2009*.
Indonesia. *Undang-Undang Nomor 6 Tahun 2023 tentang Penetapan Peraturan Pemerintah Pengganti Undang-Undang Nomor 2 Tahun 2022 tentang Cipta Kerja menjadi Undang-Undang*.
Indonesia. *Undang-Undang Nomor 11 Tahun 2006 tentang Pemerintahan Aceh*.
Indonesia. *Undang-Undang Nomor 12 Tahun 2011 tentang Pembentukan Peraturan Perundang-undangan*, as amended by *Undang-Undang Nomor 15 Tahun 2019* and *Undang-Undang Nomor 13 Tahun 2022*.
Indonesia. *Undang-Undang Nomor 13 Tahun 2012 tentang Keistimewaan Daerah Istimewa Yogyakarta*.
Indonesia. *Undang-Undang Nomor 15 Tahun 2006 tentang Badan Pemeriksa Keuangan*.
Indonesia. *Undang-Undang Nomor 18 Tahun 2008 tentang Pengelolaan Sampah*.
Indonesia. *Undang-Undang Nomor 21 Tahun 2001 tentang Otonomi Khusus bagi Provinsi Papua*, as amended by *Undang-Undang Nomor 2 Tahun 2021*.
Indonesia. *Undang-Undang Nomor 23 Tahun 2014 tentang Pemerintahan Daerah*.
Indonesia. *Undang-Undang Nomor 30 Tahun 2014 tentang Administrasi Pemerintahan*.
Indonesia. *Undang-Undang Nomor 31 Tahun 1999 tentang Pemberantasan Tindak Pidana Korupsi*, as amended by *Undang-Undang Nomor 20 Tahun 2001*.
Indonesia. *Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup*, as amended by *Undang-Undang Nomor 6 Tahun 2023*.
Indra, Mexsasai, Geofani Milthree Saragih, Ismandianto Ismandianto, and Arini Azka Muthia. "Asymmetric Regional Development as a Framework for Achieving Spatial and Regional Justice in Indonesia." *Jambura Law Review* 8, no. 1 (2026): 55–75. https://doi.org/10.33756/jlr.v1i1.32047.
International Covenant on Economic, Social and Cultural Rights. New York: United Nations, 1966.
International Labour Organization. *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All*. Geneva: ILO, 2015.
Irwin, Timothy C. *Government Guarantees: Allocating and Valuing Risk in Privately Financed Infrastructure Projects*. Washington, DC: World Bank, 2007.
Kementerian Lingkungan Hidup. "Menteri LH Sampaikan Potensi Lokasi Pembangunan PSEL, Dorong Transformasi Sampah Jadi Energi Listrik Nasional." October 9, 2025. https://kemenlh.go.id/news/detail/menteri-lh-sampaikan-potensi-lokasi-pembangunan-psel-dorong-transformasi-sampah-jadi-energi-listrik-nasional.

Kementerian Lingkungan Hidup/Badan Pengendalian Lingkungan Hidup. "Sosialisasi Implementasi Peraturan Presiden Nomor 109 Tahun 2025 tentang Pengolahan Sampah Menjadi Energi Listrik (PSEL)." Online recording, 2025. https://www.youtube.com/watch?v=k58a5Yqd2Ik.

Khan, Imran, Shahariar Chowdhury, and Kuaanan Techato. "Waste to Energy in Developing Countries—A Rapid Review: Opportunities, Challenges, and Policies in Selected Countries of Sub-Saharan Africa and South Asia towards Sustainability." *Sustainability* 14, no. 7 (2022): 3740. https://doi.org/10.3390/su14073740.

Lailam, Tanto, Putri Anggia, and Muhammad Lutfi Chakim. "The Proportionality Test Models of Competing Rights Cases in the Civil and Common Law Systems: Lesson to Learn for Indonesia." *Hasanuddin Law Review* 10, no. 2 (2024): 206–25. https://doi.org/10.20956/halrev.v10i2.4844.

Listiningrum, Prischa, Moh. Dahlan, Muhammad Anis Zhafran Al Anwary, Herlin Sri Wahyuni, and Rizqi Bachtiar. "Waste Management Without Direction in Indonesia: A Proposed Legal Reform Towards Smart Cities." *Legality: Jurnal Ilmiah Hukum* 31, no. 2 (2023): 224–44. https://doi.org/10.22219/ljih.v31i2.27375.

Mahkamah Konstitusi Republik Indonesia. *Putusan Nomor 001-021-022/PUU-I/2003 tentang Pengujian Undang-Undang Nomor 20 Tahun 2002 tentang Ketenagalistrikan*. Jakarta: MKRI, 2003.

Mahkamah Konstitusi Republik Indonesia. *Putusan Nomor 3/PUU-VIII/2010 tentang Pengujian Undang-Undang Nomor 27 Tahun 2007 tentang Pengelolaan Wilayah Pesisir dan Pulau-Pulau Kecil*. Jakarta: MKRI, 2011.

Mahkamah Konstitusi Republik Indonesia. *Putusan Nomor 25/PUU-XIV/2016 tentang Pengujian Undang-Undang Nomor 31 Tahun 1999 tentang Pemberantasan Tindak Pidana Korupsi sebagaimana telah diubah dengan Undang-Undang Nomor 20 Tahun 2001*. Jakarta: MKRI, 2017.

Malaysia. *Environmental Quality Act 1974* (Act 127).

Malaysia. *Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015*, P.U.(A) 195/2015.

Malaysia. *Renewable Energy Act 2011* (Act 725).

Malaysia. *Solid Waste and Public Cleansing Management Act 2007* (Act 672).

Maskun, Maskun, Naswar Naswar, Normiati Normiati, Muhammad Mutawalli Mukhlis, and Wiranti Wiranti. "Harmonization between National Policy and Regional Regulations in Solid Waste Management in Indonesia: A Normative-Empirical Legal Analysis." *Jambura Law Review* 7, no. 2 (2025): 726–65. https://doi.org/10.33756/jlr.v7i2.31141.

Maylana, Fitria Rizky, Idiannoor Mahyudin, Hafizianor, and Irma Febrianty. "Analisis Sisa Umur Pakai TPA Regional Banjarbakula Tanpa Diterapkannya Upaya Pemilahan Sampah Residu." *EnviroScienteae* 20, no. 3 (2024): 253–67. https://doi.org/10.20527/es.v20i3.20262.

Metropolitan Manila Development Authority v. Jancom Environmental Corporation. G.R. No. 147465. Supreme Court of the Philippines, January 30, 2002.

Millimet, Daniel L. "Environmental Federalism: A Survey of the Empirical Literature." *Case Western Reserve Law Review* 64, no. 4 (2014): 1669–1757.

Ministry of Environment and Forestry (Republic of Indonesia). *Enhanced Nationally Determined Contribution (NDC) Republic of Indonesia*. Jakarta: MoEF, 2022.

Mokodompit, Rahmat. "Infrastructural Rigidity: Formal Amendment in Indonesia, the Philippines, and South Korea." *Journal of Constitutional Change* 1, no. 1 (2026): 72–92. https://doi.org/10.66502/ryz35895.

Montini, Massimiliano. "Addressing the Conflicts between Climate-Related Renewable Energy Goals and Environmental Protection Interests under the RED Directive." *European Law Open* 3, no. 1 (2024): 209–19. https://doi.org/10.1017/elo.2024.14.

Nggilu, Novendri, Lisnawaty Wadju Badu, and Suwitno Yutye Imran. "Legal Protection Bonda and Bulango Languange [*sic*]: In Reality and Prospect." *Jambura Law Review* 3, no. 1 (2021): 19–36. https://doi.org/10.33756/jlr.v3i1.6947.

Nggilu, Novendri M., Ahmad, Moh. Rivaldi Moha, Apripari, and Moh. Hidayat Muhtar. "Abusive Constitutional Court: Dysplasia and the Destructive Power of Constitutional Court Decisions." *Estudios Constitucionales* 22, no. 2 (2024). https://estudiosconstitucionales.utalca.cl/index.php/home/article/view/188.

Nggilu, Novendri M., Zulkifli Zulkifli, Yassine Chami, Indra Perwira, and Ali Abdurahman. "The Absence of Judicial Review on Constitutional Amendments in Indonesia: Urgency and Legal Reform for Constitutional Safeguards." *Journal of Law and Legal Reform* 6, no. 2 (2025): 659–92. https://doi.org/10.15294/jllr.v6i2.20888.

Nggilu, Tri Delvi GM, Fenty Puluhulawa, and Apripari. "The Constitutional Duty–Administrative Capacity Gap in Forest Governance: Indonesia and Brazil Compared." *International Journal of Constitutional and Administrative Law* 2, no. 2 (2026): 183–217. https://doi.org/10.66502/05ybef09.

Nguyen, Trang D. T., Kosuke Kawai, and Toyohiko Nakakubo. "Drivers and Constraints of Waste-to-Energy Incineration for Sustainable Municipal Solid Waste Management in Developing Countries." *Journal of Material Cycles and Waste Management* 23, no. 4 (2021): 1688–97. https://doi.org/10.1007/s10163-021-01227-2.

O'Hare, Patrick, and Taylor Cass Talbott. "Just Transition for Waste Pickers in the Global Plastics Treaty: What Is It and Why Is It Important?" *Cambridge Prisms: Plastics* 3 (2025): e26. https://doi.org/10.1017/plc.2025.10021.

Organisation for Economic Co-operation and Development. *Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships*. Paris: OECD, 2012.

Perjanjian Kerja Sama (PKS) Pengelolaan TPA Regional Banjarbakula. Inter-regional cooperation agreement among the Provincial Government of South Kalimantan and the participating regencies and cities, as recorded in UPTD Pengelolaan TPA Sampah dan Limbah B3 Regional Banjarbakula, "Paparan Kepala UPTD," 2024–2025.

Permana, Deni Yusup, Imamulhadi Imamulhadi, Idris Idris, and Montisa Mariana. "Integrating Indigenous Wisdom in Environmental Protection: Exploring Village Authority within the Framework of State Responsibility in Indonesia." *Jambura Law Review* 7, no. 2 (2025): 359–89. https://doi.org/10.33756/jlr.v7i2.29582.

Prieur, Michel. "Non-regression in Environmental Law." *S.A.P.I.EN.S* 5, no. 2 (2012).

PT Penjaminan Infrastruktur Indonesia. *Acuan Alokasi Risiko KPBU di Indonesia*. Jakarta: PT PII, 2017.

Rahman, Nazla Arliva, Ratih Damayanti, and Rayi Kharisma Rajib. "Revolutionizing Indonesia's Administrative Court: A Bold Push for Fairness and Proportionality." *Indonesian State Law Review* 7, no. 1 (2025): 1–14. https://doi.org/10.15294/islrev.v7i1.18860.

Rasyid, Usman. "Absorptive Backsliding: Coalitional Erosion and Constitutional Resilience in Indonesia, Hungary, and Poland." *Journal of Constitutional Change* 1, no. 1 (2026): 1–23. https://doi.org/10.66502/w05y0e96.

Republic of the Philippines. *Republic Act No. 8749 (Philippine Clean Air Act of 1999)*.

Republic of the Philippines. *Republic Act No. 9003 (Ecological Solid Waste Management Act of 2000)*.

Revesz, Richard L. "Rehabilitating Interstate Competition: Rethinking the 'Race-to-the-Bottom' Rationale for Federal Environmental Regulation." *New York University Law Review* 67 (1992): 1210–54.

Ridwansyah, Muhammad. "Upaya Menemukan Konsep Ideal Hubungan Pusat-Daerah Menurut Undang-Undang Dasar Negara Republik Indonesia Tahun 1945." *Jurnal Konstitusi* 14, no. 4 (2017): 838–58. https://doi.org/10.31078/jk1447.

Rodrik, Dani, Arvind Subramanian, and Francesco Trebbi. "Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development." *Journal of Economic Growth* 9, no. 2 (2004): 131–65.

Roesler, Shannon M. "Federalism and Local Environmental Regulation." *UC Davis Law Review* 48, no. 3 (2015): 1111–69.

Sabah. *Solid Waste and Public Cleansing Management Enactment 2022*.

Sachs, Jeffrey D. "Institutions Don't Rule: Direct Effects of Geography on Per Capita Income." NBER Working Paper No. 9490. Cambridge, MA: National Bureau of Economic Research, 2003.

Shen, Ye, Min Xu, Caiyun Cui, Bo Xia, Martin Skitmore, Matthew Moorhead, and Yong Liu. "Impact of Environmental Regulation on Government Subsides [*sic*] of Public-Private Partnership Waste-to-Energy Incineration Projects: Evidence from 66 Cities in China." *Frontiers in Environmental Science* 11 (2024): 1288851. https://doi.org/10.3389/fenvs.2023.1288851.

Sistem Informasi Pengelolaan Sampah Nasional (SIPSN). Kementerian Lingkungan Hidup/Badan Pengendalian Lingkungan Hidup. Data Terverifikasi, 2026 update. https://sampahnasional.kemenlh.go.id/. Accessed November 6, 2026.

Song, Jinbo, Danrong Song, Xueqing Zhang, and Yu Sun. "Risk Identification for PPP Waste-to-Energy Incineration Projects in China." *Energy Policy* 61 (2013): 953–62. https://doi.org/10.1016/j.enpol.2013.06.041.

Studi Kelayakan (Feasibility Study) TPA Regional Banjarbakula. Technical document. Banjarmasin: Pemerintah Provinsi Kalimantan Selatan, 2023.

Sudirman, Lu, Rufinus Hotmaulana Hutauruk, Abdurrakhman Alhakim, and Winsherly Tan. "Realigning Indonesian Waste-to-Energy Policies with SDG 11: Analysis of Legal Compliance and Its Implications." *Jurnal Pembaharuan Hukum* 11, no. 2 (2024): 282–300. https://doi.org/10.26532/jph.v11i2.36832.

Tobroni, Faiq. "Mengkritisi HP-3 Perspektif Konstitusi dan Pemberdayaan Rakyat (Kontribusi Teori Sosiologi Membaca Putusan Nomor 3/PUU-VIII/2010)." *Jurnal Konstitusi* 9, no. 2 (2012): 382–401.

Turnip, Immanuel Harri, and Marhara Hasibuan. "Central Control vs. Local Liberties: Environmental Stewardship in Indonesia's Power Struggle." *Indonesian Journal of Environmental Law and Sustainable Development* 3, no. 1 (2024): 31–60. https://doi.org/10.15294/ijel.v3i1.78895.

United Nations Environment Programme. *Global Waste Management Outlook 2024: Beyond an Age of Waste*. Nairobi: UNEP, 2024. https://doi.org/10.59117/20.500.11822/44939.

UPTD Pengelolaan TPA Sampah dan Limbah B3 Regional Banjarbakula. "Paparan Kepala UPTD: Timbulan Masuk, Kuota–Realisasi, Sarana-Prasarana, dan BBM Operasional." Presentation and transcript, 2024–2025; and "Ringkasan Temuan Lapangan," 2025.

Warta Ekonomi. "Ini Alasan Tarif Listrik PLTSa Naik Jadi US$20 Sen per kWh." November 20, 2025. https://wartaekonomi.co.id/read590815/ini-alasan-tarif-listrik-pltsa-naik-jadi-us20-sen-per-kwh.

Williams, Portia Adade, Satyanarayana Narra, Edward Antwi, Wilhemina Quaye, Elizabeth Hagan, Roland Asare, Johnny Owusu-Arthur, and Vicky Shettigondahalli Ekanthalu. "Review of Barriers to Effective Implementation of Waste and Energy Management Policies in Ghana: Implications for the Promotion of Waste-to-Energy Technologies." *Waste* 1, no. 2 (2023): 313–32. https://doi.org/10.3390/waste1020021.

World Bank. *Municipal Solid Waste Incineration*. World Bank Technical Guidance Report. Washington, DC: World Bank, 1999.

World Bank. *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. Washington, DC: World Bank, 2018. https://doi.org/10.1596/978-1-4648-1329-0.

Yong, Zi Jun, Mohammed J. K. Bashir, Choon Aun Ng, Sumathi Sethupathi, Jun Wei Lim, and Pau Loke Show. "Sustainable Waste-to-Energy Development in Malaysia: Appraisal of Environmental, Financial, and Public Issues Related with Energy Recovery from Municipal Solid Waste." *Processes* 7, no. 10 (2019): 676. https://doi.org/10.3390/pr7100676.

Yuliasih, Ade, I Gde Pantja Astawa, Sarifuddin Suding, and Chami Yassine. "Constitutional Consistency of Indonesia's Job Creation Law and Its Impact on Regional Autonomy." *Jambura Law Review* 8, no. 1 (2026): 190–209. https://doi.org/10.33756/jlr.v1i1.34262.

Zbíral, Robert, Sebastiaan Princen, and Hubert Smekal. "Differentiation through Flexibility in Implementation: Strategic and Substantive Uses of Discretion in EU Directives." *European Union Politics* 24, no. 1 (2023): 102–20. https://doi.org/10.1177/14651165221126072.