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From Open Dumping to Circular Economy: Institutional Challenges in Solid Waste Governance in Tangerang Regency, Indonesia

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Abstract: Rapid urbanization within the Jabodetabekpunjur agglomeration has intensified solid waste management challenges in peri-urban regions such as Tangerang Regency, Indonesia. This study analyzes sustainable solid waste governance in Tangerang Regency, focusing on institutional coordination, integrated waste services, and contributions to urban resilience. Using a descriptive qualitative approach, data were collected through policy document analysis, government reports, academic literature, and observational notes from official forums (2024-2026). Analysis employed thematic synthesis organized around three dimensions: institutional governance, service integration, and resilience building. Key findings reveal: (1) Tangerang Regency generates approximately 2,515 tons of waste daily (0.71 kg/person/day), with non-household sources contributing 66% of total waste; (2) service coverage reaches 87%, yet only 60% of generated waste is transported to final disposal facilities; (3) the Jatiwaringin landfill has less than 5 hectares of remaining capacity from its original 33 hectares; (4) institutional fragmentation, limited waste segregation (only 34% household waste), and reliance on open dumping practices have led to a national "waste emergency" designation (Ministerial Decree No. 2567/2025). The study concludes that sustainable waste governance requires transformation from disposal-oriented to circular economy systems, supported by interregional coordination, green financing mechanisms (including carbon credits), and inclusive participation of formal and informal actors. Limitations include single-region focus and reliance on secondary data. Implications for policy emphasize the urgency of upstream waste reduction, segregated collection systems, and metropolitan-scale governance coordination.

Keywords: Integrated Waste Services, Sustainable Solid Waste Governance, Tangerang Regency, Urban Agglomeration

A. Introduction

Urbanization constitutes one of the principal dynamics shaping the development of contemporary urban regions. Population growth, residential expansion, industrial

development, increasing economic activities, and the mobility of people and goods have contributed to the emergence of urban areas that are increasingly extensive, dense, complex, and interconnected (Shorakibovna, 2026). (United Nations Human Settlements Programme (2024) indicates that rapid urbanization has resulted in more than half of the world's population now living in urban areas, a proportion that is projected to continue increasing toward 2050. Urbanization not only transforms the physical morphology of cities, but also influences social structures, consumption patterns, public service demands, and ecological relationships across spatial systems.

Within this context, cities can no longer be understood merely as isolated administrative entities, but rather as components of interdependent regional systems manifested through urban agglomerations. Urban agglomeration occurs when urban growth extends beyond administrative boundaries and establishes functional interconnections among regions through transportation networks, commuter mobility, industrial zones, economic centers, and public services (Rashed & Rashed, 2024). In Indonesia, the development of urban agglomeration areas has become a strategic priority within the National Long-Term Development Plan (RPJPN) 2025–2045 and the National Medium-Term Development Plan (RPJMN) 2025–2029, including the Jakarta Agglomeration Area, which encompasses Tangerang Regency as both a metropolitan buffer zone and a center of economic growth, industrial activity, residential expansion, and regional mobility.

Rapid urban growth has also generated significant environmental consequences, particularly the increasing generation of solid waste. Population expansion, changing consumption patterns, industrial activities, the growth of trade and logistics sectors, and high levels of urban mobility have continuously increased both the volume and diversity of urban waste (Tong et al., 2023). Waste is no longer generated solely from households, but also from markets, commercial districts, office complexes, industrial areas, public facilities, hospitals, restaurants, and informal sectors. Consequently, waste management has become a strategic issue directly associated with environmental quality, public health, infrastructure capacity, the effectiveness of public services, and the sustainability of regional development (Darma et al., 2024).

Central Java Province recorded the highest waste generation nationally in 2022, producing approximately 5.51 million tons or 15.33% of total national waste generation. This was followed by East Java with 4.95 million tons, West Java with 4.89 million tons, and the Special Capital Region of Jakarta with 3.11 million tons National Waste Management Information System, (2022). In terms of waste sources, households continue to represent the largest contributor to national waste generation. These conditions demonstrate that waste management challenges are not merely related to downstream disposal facilities, but also involve consumption behavior, waste reduction at the source, waste segregation practices, collection systems, and the governance of material value chains.

The failure to manage waste sustainably may generate extensive environmental and social risks (Bai et al., 2017). Improperly managed waste can contaminate soil and water resources, degrade air quality, increase greenhouse gas emissions, generate unpleasant odors, attract disease vectors, obstruct drainage systems, elevate flood risks, reduce urban aesthetic quality, trigger social conflicts, and intensify pressure on final disposal sites (Al-Jawaherey et al., 2025). These impacts are also closely associated with public health concerns. Inadequate waste management practices may increase the risk of cancer, acute respiratory infections, birth-related health disorders, and diarrheal diseases. Several national incidents, such as the Leuwigajah landfill landslide that claimed 143 lives and the Sarimukti landfill fire that affected hundreds of residents, illustrate that waste management problems have evolved into issues of environmental safety and regional resilience (Solopos, 2019).

Within this context, the concept of sustainable solid waste governance has become increasingly important in urban development discourse. This concept positions waste management as an integral component of regional governance, public service delivery, circular economy development, social justice, and urban resilience (Rashed, 2025). Sustainable waste governance not only emphasizes the availability of infrastructure and facilities, but also requires strong institutional capacity, cross-sectoral coordination, integrated upstream-to-downstream services, data accountability, sustainable financing mechanisms, public participation, and interregional collaboration frameworks (Rashed, 2025). This approach aligns with the demands of modern cities, which are expected not only to maintain visual cleanliness, but also to reduce waste generation, recover material resources, control residual waste, and protect urban ecosystems.

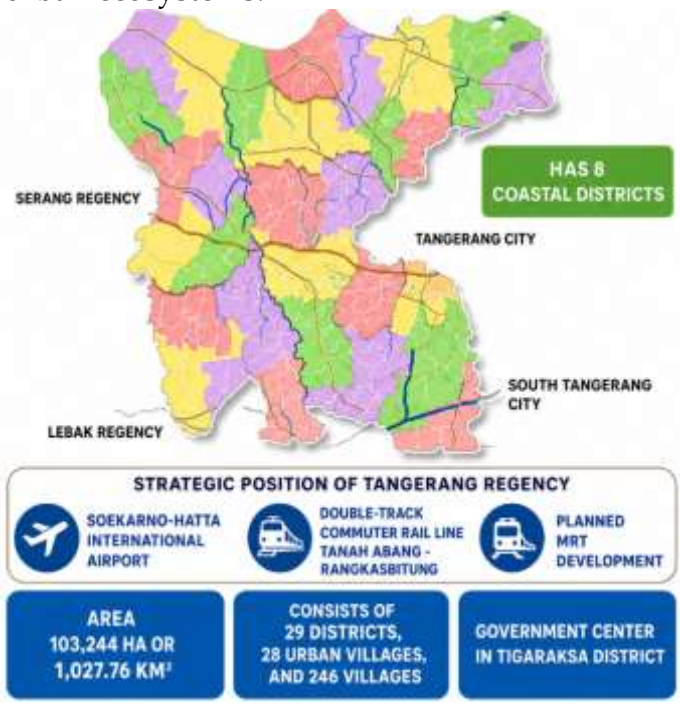

Figure 1. General Overview of The Region

Tangerang Regency constitutes one of the strategic regions within the Jabodetabekpunjur urban agglomeration area. Geographically, the region is located in Banten Province and shares direct connectivity with the Special Capital Region of Jakarta, Tangerang City, South Tangerang City, Bogor Regency, Serang Regency, Lebak Regency, and the Java Sea. Administratively, Tangerang Regency consists of 29 districts, 28 urban villages, and 246 rural villages, covering an area of approximately 103,244 hectares or 1,027.76 km² (Government of Tangerang Regency, 2026). The region also includes eight coastal districts and is connected to major transportation infrastructures such as the Jakarta–Merak Toll Road, Soekarno-Hatta International Airport, commuter rail networks, and the planned Mass Rapid Transit (MRT) expansion (Marizi, 2026). This geographical position and infrastructural connectivity have established Tangerang Regency as both a metropolitan buffer zone and a growth area with a strategic function within the broader metropolitan system.

Demographically, Tangerang Regency demonstrates significant population growth pressures. The population increased from 2,785,501 inhabitants in 2019 to 3,057,599 in 2020, 3,185,552 in 2021, 3,273,321 in 2022, 3,309,365 in 2023, and 3,459,706 in 2024. By 2025, the population is projected to reach approximately 3,542,500 inhabitants, with an estimated labor force of around 1,728,942 individuals (Marizi, 2026). This trend indicates that Tangerang Regency is experiencing not only natural population growth, but also substantial migration pressures, residential expansion, and regional transformation as part of the metropolitan dynamics of Jabodetabekpunjur.

As both a metropolitan support region and a center of industrial and residential development, Tangerang Regency faces increasingly complex development pressures. The expansion of industrial estates, warehousing zones, commercial centers, large-scale residential developments, educational districts, commercial areas, and peri-urban zones has transformed the spatial character of Tangerang Regency from a predominantly rural and agricultural area into an increasingly dense urban-suburban region (Marizi, 2026). However, this transformation has not occurred uniformly. Several districts have developed into industrial and residential centers, while others continue to retain rural, coastal, or peri-urban characteristics. This diversity of regional characteristics creates distinctive challenges for the provision and management of solid waste services.

Data compiled throughout 2024 by the Environmental Agencies (*Dinas Lingkungan Hidup*) of Tangerang Regency, Tangerang City, and South Tangerang City indicate that the total volume of waste transported daily to final disposal sites and temporary disposal facilities ranges from approximately 2,100 to 2,400 tons. This figure does not include illegally dumped or uncollected waste that fails to reach official disposal facilities, which is estimated to account for an additional 15–20%, thereby increasing the actual waste volume to approximately 2,500–2,800 tons per day. Of this total, Tangerang Regency contributes the largest share, estimated at around 900–1,100 tons per day, followed by Tangerang City with approximately 800–1,000 tons per day, and

South Tangerang City with around 600–800 tons per day. These figures demonstrate that, in aggregate, the Greater Tangerang region substantially exceeds the minimum threshold of 1,000 tons per day required under Presidential Regulation No. 109 of 2025 for the development of Waste-to-Energy Facilities (*Pembangkit Listrik Tenaga Sampah*/PSEL). Nevertheless, a major challenge lies in consolidating waste volumes originating from three different jurisdictions with distinct waste collection and management systems (Environmental and Sanitation Agency, 2023).

The composition of waste sources in Tangerang Regency reflects the characteristics of a complex urban region. Approximately 34% of waste generation originates from households, while the remaining 66% is generated from non-household sources such as traditional markets, commercial districts, public facilities, office complexes, social facilities, and strategic urban areas. This composition indicates that waste management challenges in Tangerang Regency are not solely associated with household behavior, but are also closely linked to rapidly expanding urban economic activities. Consequently, waste management strategies cannot rely exclusively on household-level educational campaigns, but must also target markets, industrial estates, commercial centers, residential developers, and business actors.

The growing burden of waste generation in Tangerang Regency has not been fully matched by service capacity improvements. Of the total estimated waste generation of approximately 2,500–2,700 tons per day, only around 60% can be transported to final disposal facilities due to limitations in infrastructure and operational capacity (Kabar6, 2025). Although service coverage has reached approximately 87%, the waste management system continues to face substantial challenges related to waste reduction at the source, waste segregation, waste processing, and residual waste management. The most significant pressure is concentrated at the Jatiwaringin Landfill Site located in Mauk District, which serves as the primary final waste processing facility in the regency. Of its total area of approximately 33 hectares, around 28 hectares have already been filled through open dumping practices, leaving only about 5 hectares of remaining capacity (Antarabanten, 2025). These conditions create serious risks of leachate contamination, methane emissions, landfill fires, unpleasant odors, and public health disturbances.

This situation demonstrates that waste management problems in Tangerang Regency have entered a phase of severe ecological and institutional pressure, attracting direct attention from the central government through national environmental control policies. The Decree of the Minister of Environment/Head of the Environmental Control Agency of the Republic of Indonesia No. 2567 of 2025 concerning Regions under Waste Emergency Status designated Tangerang Regency as one of the regions classified under waste management emergency conditions. In the decree, the emergency status is associated with the high volume and accumulation of waste that is not adequately balanced by sufficient management mechanisms, thereby posing risks of environmental pollution, ecological degradation, and public health

disturbances. The criteria for determining waste emergency status include regions that continue to apply open dumping systems, possess inadequate waste management capacity, and experience severe pressure on final disposal facilities. The inclusion of Tangerang Regency among regions classified under waste emergency status indicates that the waste management problem has surpassed the scope of a localized administrative issue and evolved into a broader environmental governance challenge requiring structural intervention and comprehensive governance transformation.

The Jatiwaringin Landfill Site (TPA Jatiwaringin) has become highly significant because this case represents the tension between metropolitan growth and the limited ecological capacity of peri-urban regions. The Ministry of Environment has explicitly issued a strong warning regarding the management of the Jatiwaringin Landfill due to its continued reliance on open dumping practices, which are considered to generate environmental pollution through uncontrolled waste disposal (Indopolitika, 2026). Furthermore, the central government temporarily suspended the landfill's operations as a corrective measure against management practices deemed inconsistent with the principles of sustainable environmental protection (Indopolitika, 2026). In several official statements, the Minister of Environment also highlighted the potential for criminal sanctions concerning alleged violations of environmental management regulations at the Jatiwaringin Landfill.

In addition, the Decree of the Minister of Environment/Head of the Environmental Impact Control Agency No. 250 of 2025 reportedly granted the Government of Tangerang Regency a period of 180 days, effective from 7 March 2025, to terminate open dumping practices and transition toward a sanitary landfill system. This intervention by the central government demonstrates that waste management is no longer viewed merely as a technical issue of urban sanitation, but rather as an integral component of environmental regulatory regimes, risk governance, and the protection of citizens' rights to a healthy environment. Within the broader metropolitan context of Jabodetabekpunjur, the Jatiwaringin Landfill case illustrates how the pressures of urbanization, industrialization, and residential expansion, when not accompanied by institutional transformation in waste governance, may produce conditions of ecological overload that threaten wider urban environmental resilience.

In response to these challenges, the Government of Tangerang Regency has initiated several improvement measures, including the implementation of sanitary landfill systems, leachate management, road access development, and the strengthening of waste processing facilities (tangerangkab, 2025). Tangerang Regency has also been designated as part of the Waste-to-Energy project within the Greater Tangerang urban agglomeration, alongside Tangerang City and South Tangerang City (tangerangkota, 2026). Nevertheless, such technology must continue to be positioned as a residual waste treatment mechanism rather than a substitute for waste reduction, segregation, and recycling efforts. As part of an urban agglomeration region, waste management in Tangerang Regency cannot be addressed solely through localized administrative

approaches. Instead, it requires an urban agglomeration framework emphasizing regional connectivity in terms of policy integration, institutional coordination, financing systems, data management, waste processing infrastructure, and public service delivery systems.

From an institutional perspective, the Government of Tangerang Regency has developed various waste management initiatives, including the establishment of the Central Waste Bank (Bank Sampah Induk) since 2023, the implementation of plastic bag reduction policies through Regent Regulation No. 139 of 2022, the operation of approximately 187 active waste banks by 2025, and the development of 52 community-based Reduce-Reuse-Recycle waste processing facilities (TPS3R). These facilities play an important role in reducing dependence on landfill disposal through integrated upstream-to-downstream waste management systems. At the national level, waste management is closely associated with broader agendas related to the green economy, low-carbon development, and climate resilience, as emphasized in the National Long-Term Development Plan (RPJPN) 2025–2045. Waste management plays a strategic role in emission reduction, the strengthening of the circular economy, and the protection of environmental carrying capacity, particularly on Java Island, which has experienced severe environmental pressures. Therefore, research on sustainable solid waste governance in Tangerang Regency is essential for understanding sustainable waste governance practices within urban agglomeration regions. This study positions waste management not merely as a technical issue, but as a strategic regional development issue closely related to urbanization, urban resilience, public service equity, circular economy development, and environmental sustainability.

B. Methods

This study employs a descriptive qualitative approach with a case study design focusing on sustainable solid waste governance in Tangerang Regency within the context of urban agglomeration. This approach was selected to obtain an in-depth understanding of the dynamics of institutional integration, public service delivery, and the strengthening of urban resilience within the regional waste management system.

The research data consist of both primary and secondary sources. Primary data were obtained through activity observations, field notes, and documentation of presentations delivered by resource persons during official forums or activities relevant to waste management, environmental governance, public service delivery, and urban development issues in Tangerang Regency. Oral information derived from the presentations of resource persons was treated as part of observational and documentary data rather than interview data, as the researcher did not conduct direct, structured, or guided question-and-answer sessions with informants. Meanwhile, secondary data were collected through document studies involving regulations,

regional development planning documents, local government performance reports, waste management policy documents, statistical data on waste generation and waste management, official publications issued by government institutions, and scientific references related to sustainable solid waste governance, urban agglomeration, public services, and urban resilience.

Data analysis was conducted using descriptive qualitative techniques through the stages of data reduction, data presentation, and conclusion drawing. Data reduction involved selecting, filtering, and categorizing information relevant to the research focus, particularly concerning institutional integration, public service integration, and urban resilience. Data presentation was organized thematically to illustrate the interrelationships among actors, policies, waste service systems, and regional capacities in responding to urban development pressures. Conclusions were drawn by interpreting emerging patterns and relating them to the concept of sustainable solid waste governance within the framework of urban agglomeration. The validity of the data was maintained through source triangulation and technique triangulation. Source triangulation was conducted by comparing information obtained from resource persons' presentations, field notes, official documents, regulations, government reports, statistical data, and scientific references. Meanwhile, technique triangulation was carried out by combining activity observation, documentation, and document studies to ensure the consistency, relevance, and reliability of the research data.

C. Results and Discussion

Urban Agglomeration and Institutional Governance of Solid Waste Management in Tangerang Regency

Tangerang Regency is not merely an administrative unit but an integral part of the Jabodetabekpunjur metropolitan configuration, where waste represents a product of urban metabolism driven by population growth, industrialization, and regional integration. As a peri-urban transitional zone spanning over 103,000 hectares with 29 districts, it is functionally linked to neighboring cities via commuter rails, logistics networks, and the Soekarno-Hatta Airport. While this strategic position enables economic growth, it also generates complex environmental pressures, demanding stronger, collaborative governance beyond traditional waste management approaches.

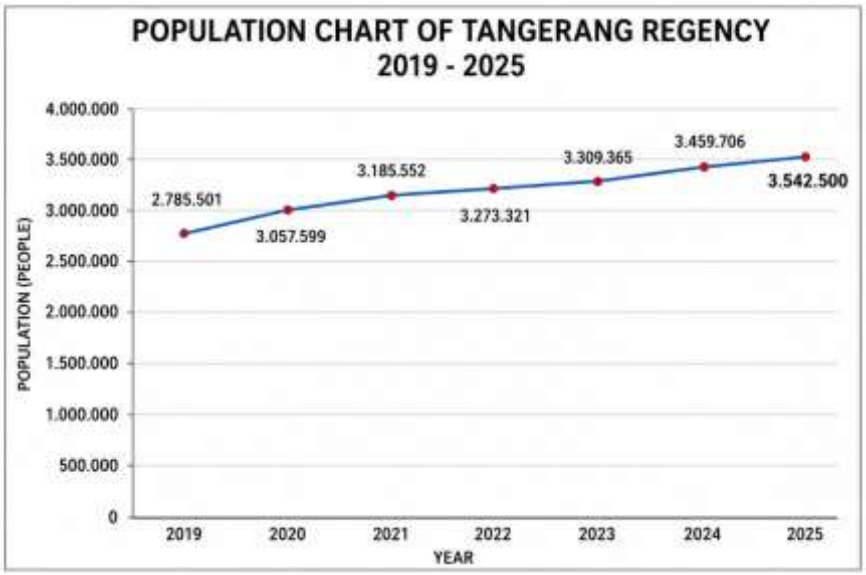

Figure 2. Population Chart of Tangerang Regency 2019-2025
Source: Tangerang Regency Government, 2026

Demographic pressure and waste generation in Tangerang Regency highlight a governance mismatch between metropolitan-scale problems and local institutional authority. The population surged from 2.79 million in 2019 to approximately 3.54 million in 2025, driving total waste to roughly 2,515 tons per day—nearly one million tons annually. With only 34% of waste from households and 66% from commercial, industrial, and institutional sources, the region faces ecological pressures from urbanization and economic metabolism. Addressing this requires integrating waste management into broader frameworks like RIPKA and RPJMN 2025–2029, moving beyond routine sanitation to strategic regional development.

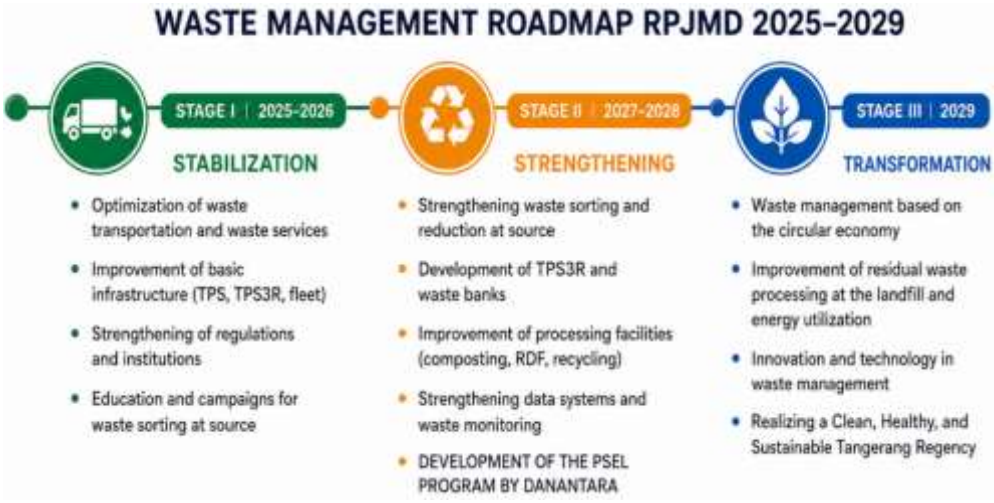

Figure 3. Waste Management Roadmap RPJMD 2025-2029
Source: Ministry of National Development Planning/National Development Planning Agency (Bappenas), 2026

Tangerang Regency has developed a Waste Management Roadmap (2025–2029) focused on circular economy principles, starting with system stabilization (2025–2026), moving to waste reduction and recycling (2027–2028), and aiming for transformation via energy recovery by 2029. However, institutional capacity remains critical: despite 87% service coverage and 52 TPS3R units, challenges like low segregation rates persist. A cross-agency task force recognizes waste governance as multisectoral, yet risks fragmentation without strong coordination. Financing (IDR 270 billion in 2026) often favors downstream transport over upstream reduction. Collaborative governance involving communities, waste banks, informal recyclers, and private sector is essential. While Waste-to-Energy (PSEL) facilities under national policy offer benefits, they risk technological lock-in unless positioned strictly for residual waste after reduction, segregation, and recycling efforts. Ultimately, waste management is central to low-carbon development and addressing Java's ecological limits.

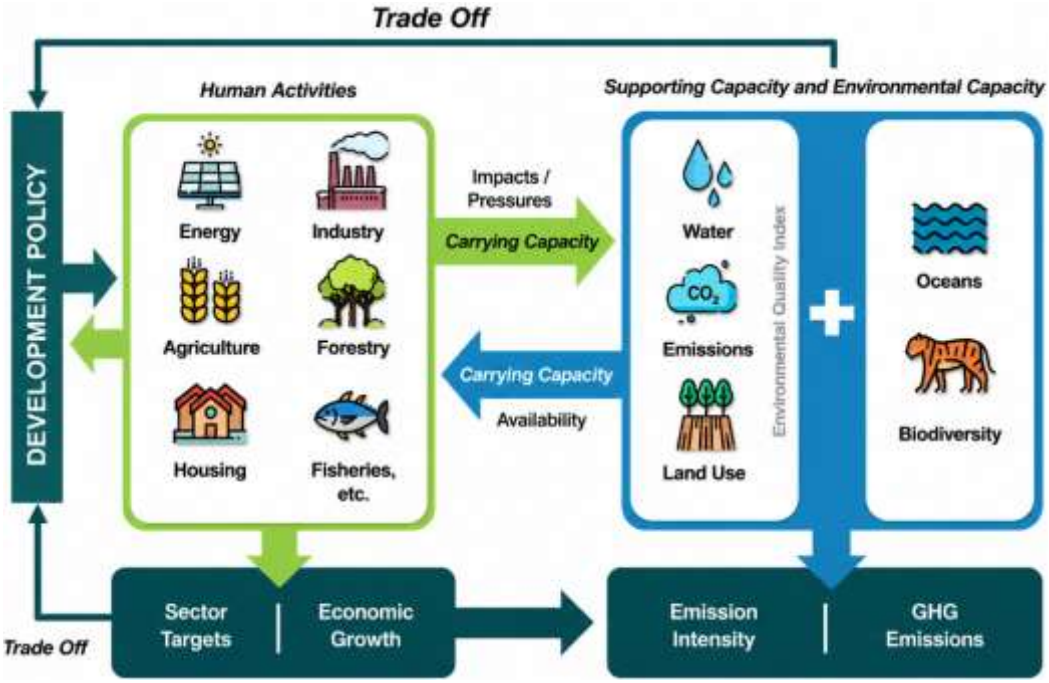

Figure 4. Sustainable Urban and Regional Development Strategy
Source: Ministry of National Development Planning/National Development Planning Agency (Bappenas), 2026

Waste management in Tangerang Regency is fundamentally a governance issue, not merely a technical shortfall. Under the Jakarta Agglomeration Area framework (RIPKA), the region requires institutional transformation from disposal-oriented, sectoral administration to prevention-oriented, collaborative governance. This means integrating public services, informal sectors, private actors, and boundary coordination. Without such change, waste volumes and crises will grow; with adaptive, participatory systems, waste management can drive a sustainable, low-carbon, and resilient Tangerang within the Jabodetabekpunjur metropolis.

Integration of Waste Management Services, Regional Connectivity, and Inclusive Growth

The integration of waste management, regional connectivity, and inclusive growth in Tangerang Regency is an urban governance issue, not merely a technical matter of waste transport. Within Jabodetabekpunjur, waste is a product of urbanization, industrialization, commuter mobility, and changing consumption. As a peri-urban industrial and residential hub integrated with Jakarta, Tangerang faces structural pressures. With 29 districts, 3.54 million people (2025), 2,515 daily tons of waste, 87% service coverage, and 52 TPS3R units, waste management requires cross-sectoral, interregional, and multi-actor integration. Reducing services to downstream collection and disposal is ecologically and fiscally fragile, merely displacing the problem. Given that 66% of waste comes from non-household sources (markets, offices, commercial zones), systems relying solely on fleets and landfills cannot address metropolitan waste streams.

A sustainable system requires an integrated upstream-to-downstream chain. Source reduction is the first stage; without it, burdens on collection, processing, and landfills intensify. Source segregation is the foundation of the circular economy, enabling materials to return to value chains rather than becoming residual waste. However, segregation fails if waste is later recombined during collection. Integration demands coordinated schedules, dedicated fleets, and preservation of material quality. Tangerang's 2025–2029 Roadmap aims for stabilization and circular transformation, but success depends on institutional capacity to connect reduction, segregation, collection, processing, and disposal. Without integration, TPS3R facilities and waste banks underperform, landfills remain dominant, and risks (leachate, methane, fires, social conflict) escalate.

Service integration reflects local government capacity to manage urban growth and environmental protection. Despite a Master Plan, IDR 270 billion (2026 budget), a Cross-Agency Task Force, and landfill restructuring, integration requires interagency coordination, interoperable data, and technical capacity at district and village levels. Institutional fragmentation is a major challenge: waste management intersects with environment, public works, health, trade, and spatial planning, yet agencies operate sectorally. Regional connectivity further complicates matters waste crosses administrative boundaries. Therefore, Tangerang's waste governance must connect with Tangerang City, South Tangerang, Jakarta, and the RIPKA agenda. Moreover, inclusive growth demands equitable services for peri-urban, coastal, and low-income communities, preventing ecological injustice where disadvantaged groups bear pollution burdens.

Industrial areas require particular attention. Business actors must be integrated into the waste ecosystem through reduction obligations, data reporting, and financing. Growth justice requires that economic beneficiaries bear proportional ecological

responsibilities. Communities, waste banks, and informal sectors are essential actors not merely waste producers. Waste segregation campaigns need incentives and assurance that segregated streams are treated differently. Waste pickers and collectors should be recognized through partnerships and protection. The circular economy reduction, reuse, recycling, composting offers substantial opportunities given Tangerang's population and economic activity. However, circular transformation requires product regulations, green procurement, and producer obligations, moving beyond landfill-dominated paradigms to create green jobs and strengthen SMEs.

Waste integration is linked to climate resilience. Tangerang targets reducing emission intensity from 19.79% (2025) to 22.08% (2029) and raising cumulative CO_2eq reductions to 3.55 million tons. PSEL (Waste-to-Energy) under Presidential Regulation 109/2025 designates Greater Tangerang as a priority area, offering emissions reduction (50–80% vs. landfills), energy for 30,000 households, and 90% land savings. However, PSEL must treat only residual waste after reduction, segregation, and recycling to avoid weakening upstream incentives. Ultimately, traditional paradigms that see waste as a localized problem must shift to systemic governance: integrated services, interregional connectivity, private-sector obligations, informal-sector recognition, and green financing. Through collaborative, adaptive, and inclusive systems, Tangerang can transform waste from an ecological burden into an instrument for equitable, low-carbon, sustainable metropolitan agglomeration.

Urban Resilience, Carbon Credits, and a Sustainable Solid Waste Governance Model

Urban resilience in Tangerang Regency, within the Jabodetabekpunjur agglomeration, is the capacity to absorb and recover from metropolitan pressures. Waste management must shift from a technical sanitation service to a core resilience infrastructure affecting public health, economic stability, and long-term risk mitigation. As a peri-urban industrial and residential zone, the region faces structural waste challenges from rapid urbanization. With a 2025 population of approximately 3.54 million generating 2,515 tons of waste daily (87% service coverage, 52 TPS3R units), waste governance requires systemic, cross-sectoral, and risk-based approaches rather than mere collection and disposal.

Resilience depends not only on physical assets like fleets and landfills but also on institutional quality, fiscal capacity, and data reliability. Waste crises emerge when segregation fails, services are inequitable, or coordination collapses. With per capita waste at 0.710 kg/day (34% household, 66% non-household from markets and industries), the waste profile reflects agglomeration metabolism. Without adaptive systems, waste generates ecological risks (leachate, methane), health burdens (respiratory infections), fiscal strain (rising transport costs), social injustice (peri-urban and coastal communities), and institutional fragmentation, undermining regional development.

Waste generation outpaces institutional transformation. The 2025–2029 Roadmap promotes circular economy goals, yet implementation suffers from fragmented authority across agencies, districts, and villages. Low source segregation is not merely low awareness but poor institutional design mixed collection fleets undo household efforts. Without upstream segregation, composting, recycling, and TPS3R facilities fail, leaving landfills dominant and increasingly risky. The 2026 budget of IDR 270 billion shows commitment, but if spent mainly on downstream transport, it perpetuates unsustainable patterns. Green financing (bonds, EPR, carbon trading) is essential for shifting investments toward reduction, data systems, and circular incentives.

Tangerang Regency holds significant potential for carbon credits from waste-sector methane reduction (composting, landfill gas capture, RDF), aligning with low-carbon targets: reducing emission intensity from 19.79% (2025) to 22.08% (2029) and raising cumulative CO_2eq reductions to 3.55 million tons. To qualify, projects must demonstrate additionality, robust baselines, MRV, and registry compliance. A regional carbon roadmap integrated with the waste plan is needed, starting with Jatiwaringin Landfill methane capture and market composting. Sustainable governance requires adaptive, collaborative, inclusive, and systems-based principles connecting households, informal actors, private sector, and neighboring governments.

Ultimately, waste governance is a concrete indicator of Tangerang Regency's urban resilience amid agglomeration pressures. Reactive, fragmented, downstream-only management will deepen ecological and social vulnerabilities. Conversely, adaptive, data-driven, and upstream-downstream integrated institutions supported by green finance and high-integrity carbon credits can transform waste into a tool for protecting public health, reducing climate risks, strengthening the circular economy, and realizing inclusive, low-carbon, and sustainable metropolitan development. The choice is between a fragile linear system and a resilient circular future.

D. Conclusions

Based on the research findings, it can be concluded that waste management problems in Tangerang Regency constitute a strategic issue of metropolitan governance arising from urbanization, agglomeration, industrial growth, residential expansion, and increasing economic activity within the Jabodetabekpunjur system. The key finding reveals that waste management can no longer be understood merely as a technical matter of collection, transportation, and final disposal, but must instead be positioned as an integral component of regional governance, public service delivery, urban resilience, and sustainable development. The high volume of waste generation, dominance of non-household waste sources, limited institutional capacity, growing pressure on final disposal sites, low levels of source segregation, and unequal service provision collectively indicate the urgent need for transformation toward adaptive, collaborative, inclusive, data-driven, and fully integrated sustainable solid waste

governance. Such governance must connect the entire waste management chain from upstream to downstream, including waste reduction, segregation, collection, transportation, processing, recycling, material recovery, and safe residual waste management. The practical implication of this study is that Tangerang Regency authorities must implement a comprehensive governance transformation supported by several strategic actions. First, stronger institutional capacity must be developed through dedicated waste management agencies with clear mandates and adequate staffing. Second, integrated data and policy systems across administrative boundaries are essential for tracking waste flows and coordinating inter-district solutions. Third, sustainable financing mechanisms should include circular economy development, utilization of green financing instruments including carbon credits, and innovative funding models. Fourth, active involvement of communities, informal sectors, environmental organizations, business actors, and private sectors within a metropolitan governance framework is critical. Waste management in Tangerang Regency therefore functions not only as an instrument for environmental protection and public health improvement, but also as a foundation for low-carbon, socially equitable, resilient, inclusive, and sustainable regional development amid growing pressures of future urban agglomeration. Future research should investigate specific governance models that successfully integrate upstream waste reduction with downstream processing across multiple administrative jurisdictions within metropolitan regions. Comparative studies examining different financing mechanisms, including carbon credit utilization and public-private partnership structures, would provide evidence for sustainable funding approaches. Additionally, longitudinal research tracking the effectiveness of source segregation programs and community engagement strategies would inform behavior change interventions. Action research collaborating with informal sector waste workers to design inclusive transition pathways would ensure social equity in governance transformation. Finally, studies examining the relationship between waste governance quality and urban resilience indicators would strengthen the evidence base for positioning waste management as a strategic development priority.

E. Acknowledgement

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Jabodetabekpunjur metropolitan area.

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