Original Article *Journal of Sustainability and Environmental Management (JOSEM), Vol. 4, No. 3 (2025), 165 – 171*
p-ISSN 2822-1729, e-ISSN 2822-1737 Available online at https://www.nepjol.info/index.php/josem

Municipal Solid Waste Generation, Composition, and Management in Nigeria: A 25-Year Secondary Data Review

Abideen Salawu Alamu

Innovation and technology policy department, Nigerian institute of social and economic research (NISER) PMBS, UI post office, Ibadan, Oyo State, Nigeria

Corresponding author: alamu2000ng@gmail.com

Abstract: Municipal solid waste (MSW) management in Nigeria poses growing environmental and public health challenges due to rapid urbanization and population growth. This study applied a secondary data analysis approach, synthesizing peer-reviewed studies, institutional reports, and datasets published between 2000 and 2025 to examine temporal trends and spatial variations in waste generation and management. Results showed a strong correlation ($r \approx 0.78$) between urbanization and per capita waste generation, which ranged from 0.35 – 1.02 kg/person/day (mean $\approx$ 0.6). Total national waste increased from about 25,000 tonnes/day in 2000 to 35,000 tonnes/day in 2025, with organic waste ($\approx$55%) predominating. Open dumping remains the main disposal method ($\approx$80%), while recycling and composting are limited. The discussion highlights that urban growth, though driving waste increase, also creates opportunities for circular economy adoption. The study concludes that strengthening policy enforcement, financing, and community participation is essential for achieving sustainable and health-conscious waste management in Nigeria.

Keywords: *Municipal solid waste, Circular economy, Sustainable development, Waste generation, Nigeria*

Conflicts of interest: None
Supporting agencies: None

Received 29.09.2025; Revised 10.12.2025; Accepted 23.12.2025

Cite This Article: Alamu, A.S. (2025). Municipal Solid Waste Generation, Composition, and Management in Nigeria: A 25-Year Secondary Data Review. *Journal of Sustainability and Environmental Management*, *4*(3), 165-171.

1. Introduction

Municipal solid waste (MSW) management is a growing environmental, social, and public health concern in Nigeria, which is driven by rapid urbanization, population growth, and changing consumption patterns (Ogwueleka, 2009; Ezeudu, Tenebe, & Ujah, 2024; Etim, Tashi Choedron, & Ajai, 2024). The country generates substantial quantities of MSW, with national estimates ranging from 25,000 to 35,000 tonnes per day (World Bank, 2018; NBS, 2019), thereby placing immense pressure on municipal infrastructure and governance systems. The complexity of waste streams, including organic matter, plastics, metals, and paper, has increased alongside economic development and urban consumerism, particularly in major cities such as Lagos, Abuja, Port Harcourt, and Enugu (Etim et al., 2024; Maiha & Yusuf, 2025).

Historically, Nigeria's MSW system has been linear and largely informal, dominated by open dumping, open burning, and limited recycling (Ogwueleka, 2009; Maton, Dabi, Dodo, & Nesla, 2016). Such practices contribute to environmental degradation, greenhouse gas emissions, and public health risks, including respiratory illness, vector-borne diseases, and groundwater contamination (Omokaro, Michael, & Evgenievich, 2024; Adetona et al., 2020; Okafor, Ibekwe, Nzekwe, & Ajaero, 2022). Limited household willingness-to-pay, inadequate municipal funding, and weak enforcement of regulations further constrain service delivery and sustainability (Ayanshola et al, 2015; Salami et al., 2019).

Case studies illustrate the spatial heterogeneity and challenges of MSW management in Nigeria. In Lagos, population density and rapid urban growth have intensified waste generation, however, public-private partnerships and awareness campaigns have begun to improve collection efficiency (Etim et al., 2024; World Bank, 2020). In Ilorin, low financial contributions from households limit improvements in waste services, highlighting the socio-economic dimension of waste management (Ayanshola et al., 2015). Also, in Jimeta-Yola, fragmented governance and insufficient infrastructure underscore the need for innovative institutional and PPP strategies (Liman & Ngah, 2015). In Enugu and Uyo, studies reveal growing attention to sustainable practices, including composting, recycling,

and improved logistics, although coverage remains limited (Anijiofor-Ike & Aniagolu, 2025; Onyishi, Wali, & Okwakpam, 2023; Bassey, Tom, & Okon, 2024).

Recent research emphasizes the emergence of circular economy strategies, including waste-to-energy (WtE) projects, extended producer responsibility (EPR), and multi-criteria decision-making (MCDM) for selecting optimal waste management techniques (Ezeudu et al., 2024; Muhammad, Badi, Haruna, & Mohammed, 2021; Federal Ministry of Environment, 2024). Pilot initiatives in Lagos, Abuja, and other cities indicate potential for integrating recycling, energy recovery, and digital mapping into formal MSW systems (Okafor et al., 2022; World Bank, 2020). Despite these advances, implementation remains patchy and uneven, constrained by infrastructural, financial, and institutional limitations (Salami et al., 2019). While numerous studies have investigated MSW generation, composition, and management practices at local and city levels, there is a paucity of integrated, longitudinal synthesis across Nigeria. Such synthesis is critical for understanding temporal trends, spatial disparities, environmental impacts, and the potential for circular interventions at national and urban scales.

To address this gap, this study systematically synthesizes data from studies conducted between 2000 and 2025. It aims to:

1) Examine temporal trends in national and city-level waste generation and per capita production
2) Characterize MSW composition and assess implications for recycling and Waste to Energy potential
3) Evaluate current management practices and emerging circular economy initiatives
4) Analyze environmental, health, and socioeconomic drivers influencing waste outcomes
5) Provide actionable insights to guide sustainable, circular, and health-conscious MSW management policies in Nigeria.

2. Materials and method

2.1 Search Terms and Strategy

This study employed a secondary data analysis approach to examine the relationship between urbanization and waste generation in Nigeria between 2000 and 2024. A systematic search strategy was developed to identify published studies, datasets, and institutional reports. The search incorporated combinations of the following keywords: “urbanization in Nigeria”, “waste generation in Nigeria,” “municipal solid waste management,” “urban growth and waste generation,” and “solid waste trends in Nigeria”, Search filters were applied to limit results to English-language materials, full-text availability, and publications from 2000 to 2025.

2.2 Data Sources

Data and literature were obtained from both academic databases and institutional repositories to ensure comprehensive coverage and credibility. The academic databases consulted included Google Scholar, Scopus, African Journal Online (AJOL), and Web of Science.

2.3 Inclusion and Exclusion Criteria

Publications were included if they (i) were published between 2000 and 2024, (ii) focused specifically on Nigeria at national, regional, or city levels, and (iii) provided quantitative or descriptive data on urban population dynamics or municipal solid waste generation. For the purpose of this review, quantitative data on waste generation referred to numerical estimates such as waste generation rates (e.g. kg/person/day), total municipal solid waste produced per day or per year (e.g., tonnes/day), or percentage composition of waste streams.

Only materials with clearly stated methodologies, credible data sources, and full-text availability in English were accepted. Studies were excluded if they focused on other countries, contained incomplete or duplicated datasets, reported data prior to 2000, or lacked methodological transparency.

Data extracted from the selected studies were analyzed using descriptive statistical methods. Reported values for per capita waste generation were summarized by calculating the arithmetic mean of the study-level estimates reported across the included studies. No formal meta-analytic model was applied due to the heterogeneity in study designs, data collection methods, and reporting formats among the reviewed publications.

2.4 Screening and Selection Process

The study selection process followed the principles outlined in the PRISMA guidelines. A total of 60 records were initially identified from multiple databases, including 25 articles from Google Scholar, 15 from Scopus, 10 from African Journals Online, and 10 from Web of Science.

All retrieved records were exported into a reference management system for organization and duplicate removal. During this process, 10 duplicate records were identified and removed, leaving 50 unique articles for the initial assessment.

Subsequently, titles and abstracts were screened against the predefined eligibility criteria, resulting in the exclusion of 14 articles that did not meet the inclusion requirements. This process left 36 articles for detailed full-text review.

During the full-text screening stage, an additional 11 studies were excluded because their full texts could not be accessed despite reasonable efforts to retrieve them. Consequently, 25 studies met the eligibility criteria and were retained for the final systematic review.

The flow diagram of the study selection process is shown in the PRISMA diagram in figure 1

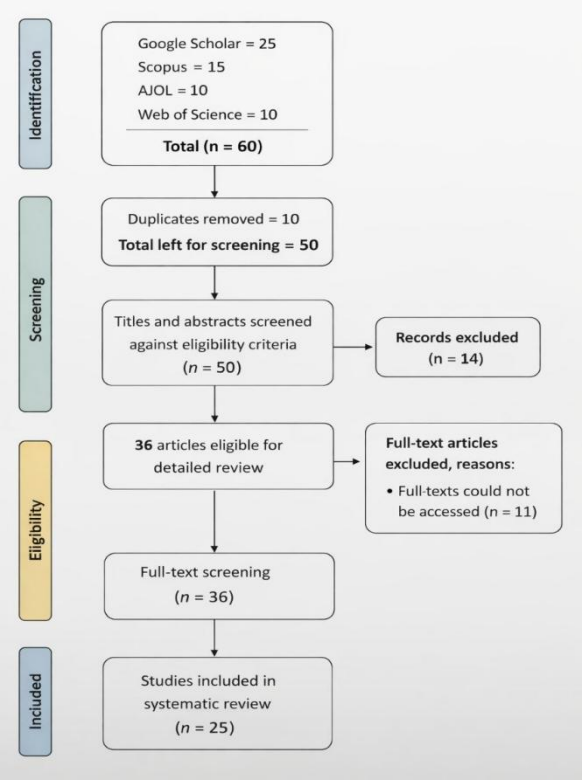

Figure 1: Flow diagram of the study selection process

2.5 Data Extraction and Analysis

Relevant variables were systematically extracted from each eligible study. The primary variables included year of data collection, urban population, total municipal solid waste generated (in tonnes per day, per capita waste generation rate (kg/person/day), urbanization rate, and study location (national, regional, or city-level). Supplementary variables such as waste composition, management method (collection, recycling, or disposal), and socioeconomic indicators were also recorded when available. All data were entered into a structured Microsoft Excel spreadsheet for collation and verification. Descriptive statistics were employed to summarize temporal and spatial trends in urbanization and waste generation across the study period (2000–2024). Graphical representations such as line graphs, bar charts were produced to visualize these relationships and to depict long-term trends across major Nigerian cities and at the national level.

Because the reviewed studies were conducted in different years and locations, national waste generation estimates were synthesized from reported values in the literature. These values were aggregated and used to illustrate the overall temporal trend between 2000 and 2025. The trend line presented in Figure 2 therefore represents a descriptive visualization of the aggregated estimates rather than a statistical model fitted to continuous yearly observations.

3. Results

3.1 Waste Generation Trends

Per capita waste generation ranged between 0.35 and 1.02 kg/person/day, with a national mean of approximately 0.6 kg/person/day. Total daily waste generation varied between 25,000 and 35,000 tonnes/day (As illustrated in figure 1), equivalent to ≈10.9 million tonnes annually (Ogwueleka, 2009; NBS, 2019; Maiha & Yusuf, 2025). High-generation urban centers include Lagos (0.72–1.02 kg/person/day), Abuja (0.61 kg/person/day), and Port Harcourt (0.64 kg/person/day), whereas lower rates were observed in Ilorin, Jimeta-Yola, and Jalingo (0.35−0.45 kg/person/day) (Ayanshola et al., 2015; Liman & Ngah, 2015; Chukwu, 2024). Analysis shows a strong positive correlation ($r \approx 0.78$) between urbanization and per capita waste generation. Cities with >70% urbanization consistently reported per capita waste >0.7 kg/person/day, reflecting the combined effects of population density, income growth, and increased consumption patterns.

Temporal analysis indicates a gradual upward trend in national municipal solid waste generation between 2000 and 2025. This pattern reflects the combined influence of urban population growth, economic expansion, and changing consumption patterns across Nigerian cities.

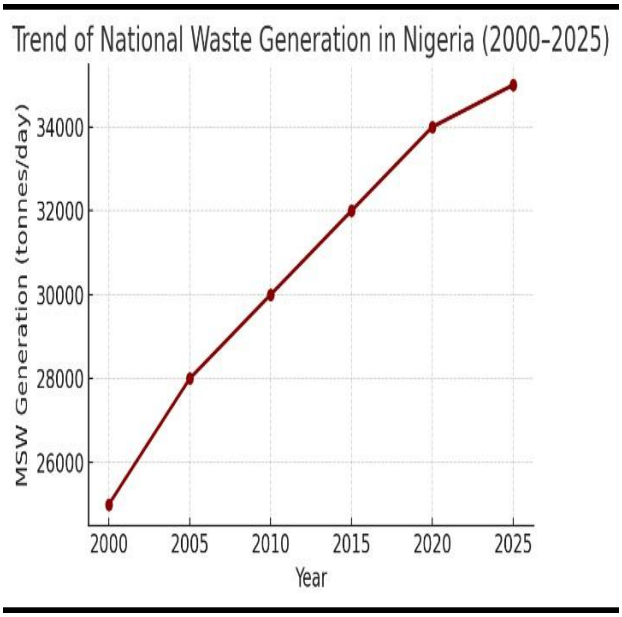

Figure 2: Trends of National Waste Generation in Nigeria (2000-2025)

The figure illustrates the overall upward trend in national municipal solid waste generation over the study period, synthesized from estimates reported in the reviewed studies and institutional datasets.

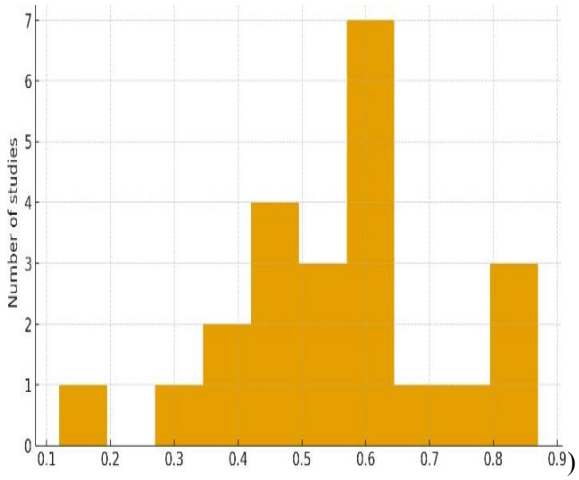

Figure 3: Distribution of Per Capita Waste Generation (Kg/person/day) Across 25 Studies

The histogram shows the variation in waste generation rates among studies, with most values clustering around 0.55–0.65 kg/person/day.

3.2 Waste Composition

Across all reviewed studies, organic waste remains the dominant component, representing 45-60% of total waste (mean≈55%), followed by plastics (10-20%) and paper (7-10%). Other components such as metals, glass, and textiles accounted for less than 10% (Ogwueleka, 2009; Okafor et al., 2022a; Etim et al., 2024). An increasing share of plastics has been observed since 2018, corresponding with economic growth and changing consumption patterns (Ezeudu et al., 2024).

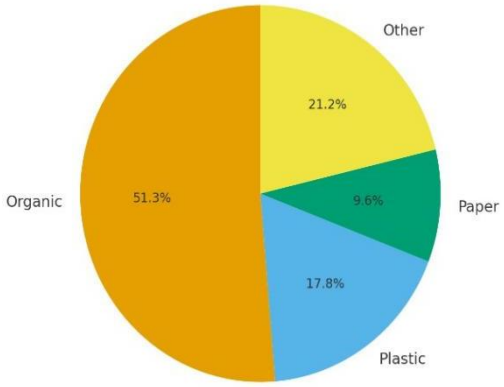

Figure 4: Average Waste Composition in Nigeria (2000-2025)

The pie chart displays the mean proportion of major waste fractions, organic, plastic, paper, metals, and others aggregated from 25 studies.

3.3 Waste Management Practices

Open dumping remains the dominant disposal method, reported in 80% of studies, with collection efficiency averaging 30–60% (Ogwueleka, 2009; Salami et al., 2019). Door-to-door collection is prevalent in major urban centers like Lagos, Abuja, and Enugu, achieving efficiencies of approximately 70% in cities implementing Public- Private Partnership (PPP) frameworks (Etim et al., 2024; Onwualu & Iroegbu, 2021). Recycling and composting are largely informal (<15%), while waste-to-energy (WtE) is in pilot or feasibility stages in Lagos and Abuja, with projected energy outputs of 19–35 MW (FME, 2024; Okafor et al., 2022). emerging trends include community-based recycling programs, digital waste mapping, and increased youth participation, indicating gradual movement toward a circular waste management system.

Figure 5: Comparative Prevalence of Waste Management Methods in Nigeria (2000–2025).

Bar chart comparing the relative share of open dumping, door-to-door collection, recycling, composting, and waste-to-energy practices across the studies.

3.4 Environment and Health Implications

Approximately 60% of uncollected waste is openly burned, contributing 1.1–1.4 million tonnes CO_2 per year (Okafor et al., 2022b). High concentrations of CO (Carbon monoxide) have been recorded near dumpsites in Lagos (Adetona et al., 2020), while groundwater pollution from leachate has been reported in northern Nigeria (Maton et al., 2016). Communities near dumpsites report increased respiratory and vector-borne diseases (Omokaro et al., 2024), confirming the direct public health burden of uncontrolled dumping.

3.5 Socioeconomic and Institutional Context

Waste generation was found to increase with GDP and income levels, whereas affordability constraints limited willingness to pay for improved waste collection (Ayanshola et al., 2015). The informal recycling sector is responsible for recovering about 30% of recyclable materials, though often unrecognized in formal policy frameworks (Ezeudu et al., 2024). Institutional challenges including poor funding, fragmented roles, and weak enforcement remain major impediments to achieving sustainable waste management outcomes.

3.6 Emerging Policy and Technological Trends (2022–2025)

Recent years have seen growing interest in circular economy strategies and Extended Producer Responsibility (EPR) schemes (Ezeudu et al., 2024). The Federal Ministry of Environment (FME, 2024) identified waste-to-energy and digital mapping as part of its National MSW Reform Agenda, aimed at scaling up recycling and improving data-driven management. Lagos and Abuja have recorded promising feasibility results for 19–35 MW energy recovery potentials from Municipal Solid Waste (Okafor et al., 2022a; FME, 2024).

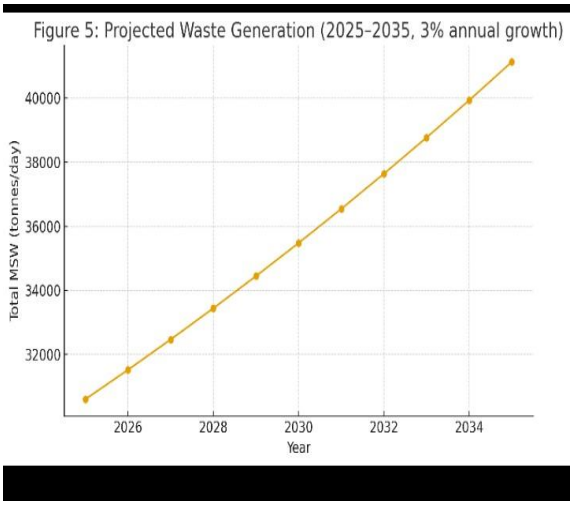

Figure 6: Projected National Waste Generation (2025-2035)

Projection curve showing expected increases in total waste quantities under business l and improved management scenarios.

4. Discussion

4.1 Shift in Waste Composition and Material Flows

The high organic fraction (~55%) presents a major opportunity for large-scale composting and anaerobic digestion systems across Nigerian cities. Harnessing this biodegradable component could significantly reduce the volume of waste reaching dumpsites while simultaneously producing valuable outputs such as organic fertilizer and biogas. Such an approach would be particularly beneficial in Nigeria, where declining soil fertility and increasing energy demand remain critical challenges. By converting organic waste into compost, municipalities could improve soil health and agricultural productivity, while anaerobic digestion systems could generate decentralized energy for urban and peri-urban communities.

The growing presence of plastics in the waste stream (~10–20%) reflects broader shifts in consumption patterns associated with urbanization and increased reliance on packaged consumer goods. The persistence of these materials in the environment poses long-term ecological risks, including marine pollution, drainage blockage, and microplastic contamination. Strengthening recycling infrastructure, encouraging household waste segregation, and implementing Extended Producer Responsibility policies could significantly reduce plastic leakage into the environment while promoting a circular material economy.

4.2 Evaluating Current Management Practices

The continued reliance on open dumping (~80%) highlights significant structural challenges within Nigeria's municipal waste management systems. Uncontrolled disposal practices often arise from limited financial resources, inadequate infrastructure, and weak regulatory enforcement. These systemic limitations prevent municipalities from transitioning toward more sustainable waste treatment options such as sanitary landfilling, composting, and material recovery.

The relatively limited adoption of recycling and composting practices (<15%) suggests that most waste management systems remain focused on disposal rather than resource recovery. Expanding recycling initiatives could significantly reduce landfill pressures while simultaneously creating employment opportunities within the recycling sector. In addition, improving collection systems and integrating informal waste pickers into formal waste management frameworks could strengthen resource recovery efforts and improve the efficiency of urban waste systems.

4.3 Environmental and Health Implications

The widespread practice of open waste burning (~60% of uncollected waste) contributes significantly to air pollution and greenhouse gas emissions in urban environments. Burning mixed municipal waste releases harmful pollutants such as particulate matter, carbon monoxide, and toxic organic compounds, which can severely degrade air quality and increase the prevalence of respiratory illnesses among nearby populations. These environmental health risks highlight the urgent need for safer waste treatment technologies and improved waste collection systems.

The associated greenhouse gas emissions (~1.1–1.4 million tonnes of CO_2 annually) further illustrate the climate implications of poorly managed municipal waste. Reducing uncontrolled burning through improved waste management infrastructure could therefore contribute to national climate mitigation efforts while simultaneously improving public health outcomes.

4.4 Socioeconomic and Institutional Context

The strong association between urbanization and waste generation ($r \approx 0.78$) underscores the influence of demographic growth and economic activity on municipal waste dynamics. As cities expand and consumption levels rise, waste streams become larger and more complex,

placing increasing pressure on already strained municipal infrastructure. Addressing this challenge will require not only improved waste management systems but also integrated urban planning strategies that account for the environmental impacts of rapid urban growth.

The substantial contribution of the informal recycling sector (~30% material recovery in some cities) demonstrates the critical role played by waste pickers in diverting recyclable materials from disposal sites. Despite operating outside formal regulatory frameworks, these actors provide essential environmental services while supporting local recycling markets. Integrating informal recyclers into formal waste management systems could improve recycling efficiency while also promoting social inclusion and economic stability.

4.5 Emerging Policy and Technological Opportunities

The growing interest in waste-to-energy technologies (19–35 MW projected capacity in major cities) reflects increasing recognition of municipal waste as a potential energy resource. Converting waste into electricity could reduce landfill dependence while simultaneously contributing to urban energy supply. In a country facing persistent energy shortages, waste-to-energy facilities could provide an additional source of decentralized power generation.

Similarly, emerging policy initiatives such as Extended Producer Responsibility programs represent important steps toward reducing waste generation at the source. By holding producers accountable for the lifecycle impacts of their products, such policies can encourage the design of more sustainable packaging materials while strengthening recycling systems.

4.6 Comparison with Regional and Global Context

The predominance of biodegradable materials in municipal waste (~55%) reflects patterns commonly observed across many developing countries, where food waste and other organic materials dominate household refuse. This similarity suggests that waste management strategies successfully implemented in other developing regions particularly composting and anaerobic digestion may also be applicable within the Nigerian context.

At the same time, the continued reliance on uncontrolled disposal practices (~80%) mirrors broader infrastructural and governance challenges faced by many rapidly urbanizing cities across sub-Saharan Africa. Addressing these challenges will require integrated solutions that combine technological innovation with institutional reform, public awareness campaigns, and stronger environmental regulations.

4.7 Future Research

The limited availability of consistent national waste datasets highlights the need for more comprehensive monitoring systems capable of tracking waste generation patterns across Nigerian cities. Improved data collection would enhance the accuracy of waste generation estimates and support evidence-based policy development.

Further research is also needed to evaluate the environmental and economic performance of emerging waste management technologies such as waste-to-energy facilities and large-scale composting programs. Applying life-cycle assessment approaches could provide deeper insights into the sustainability implications of different waste management strategies and guide future policy decisions.

5. Conclusion

Nigeria's municipal solid waste (MSW) system is in a transitional stage, moving from a predominantly linear model toward circular waste management, although open dumping and low collection efficiency remain widespread. Despite these challenges, emerging efforts in recycling, composting, waste-to-energy, and digital waste solutions demonstrate significant potential for systemic transformation.

The greatest opportunity lies in advancing circular economy strategies, particularly through improved management of organic and plastic waste streams. The most critical action for accelerating this transition is the formalization and integration of the informal recycling sector, alongside strategic investment in organic waste processing infrastructure and strong regulatory and financial frameworks. These measures would deliver substantial environmental, economic, and public health benefits.

With coordinated policy action, technological innovation, and stakeholder collaboration, Nigeria can transform waste from a growing urban challenge into a valuable resource that supports sustainable development and environmental resilience.

References

Adetona, O., Ozoh, O. B., Oluseyi, T., Uzoegwu, Q., Odei, J., & Lucas, M. (2020). An exploratory evaluation of the potential pulmonary, neurological and other health effects of chronic exposure to emissions from municipal solid waste fires at a large dumpsite in Olusosun, Lagos, Nigeria. *Environmental Science and Pollution Research International, 27*(24), 30885–30892. https://doi.org/10.1007/s11356-020-09701-4

Anijiofor-Ike, S. C., & Aniagolu, G. C. (2025). Characterization and management strategies for municipal solid waste in Enugu Metropolis: Insights for sustainable waste solutions. *Journal of Engineering Research and Reports, 27*(3), 70–81. https://doi.org/10.9734/jerr/2025/v27i31418

Ayanshola, A. M., Aremu, A. S., Jacob, S. O., Bilewu, S. O., & Salami, A. W. (2015). Evaluation of municipal solid waste management system and willingness-to-

pay for its improvements in Ilorin, Kwara State, Nigeria. *Nigerian Journal of Technology, 34*(4), 868–874. https://doi.org/10.4314/njt.344.1021

Bassey, U., Tom, O., & Okon, I. (2024). Characteristics and management of municipal solid waste in Uyo, Akwa Ibom State, Nigeria. *Scientific Reports, 14*, 10971. https://doi.org/10.1038/s41598-024-61108-0

Chukwu, P. I. (2024). Characteristics of solid waste generated and their storage facilities in Jalingo, Taraba State, Nigeria. *Gombe Journal of Geography, Environment & Earth Science.*

Etim, E., Tashi Choedron, K., & Ajai, O. (2024). Municipal solid waste management in Lagos State: Expansion diffusion of awareness. *Waste Management, 190,* 261–272. https://doi.org/10.1016/j.wasman.2024.09.032

Ezeudu, O. B., Tenebe, I. T., & Ujah, C. O. (2024). Status of production, consumption, and end-of-life waste management of plastic and plastic products in Nigeria: Prospects for a circular plastics economy. *Sustainability, 16*(18), 7900. https://doi.org/10.3390/su16187900

Federal Ministry of Environment. (2024). *Waste-to-energy potential of municipal solid waste in Abuja, Nigeria.*

Liman, A., & Ngah, I. (2015). Appraisal of municipal solid waste management (MSWM) in Jimeta-Yola, Adamawa State of Nigeria: The need for innovative PPP strategies. *Journal Teknologi (Sciences & Engineering), 77*(15), 43–49. https://doi.org/10.11113/jt.v77.6537

Maiha, A. I., & Yusuf, F. I. (2025). Evaluation of solid waste generation trends across Nigeria for sustainable management. *Dutse Journal of Pure and Applied Sciences (DUJOPAS), 11*(1b), 142–148. https://doi.org/10.4314/dujopas.v11i1b.16

Maton, S. M., Dabi, D. D., Dodo, J. D., & Nesla, R. A. (2016). Environmental hazards of continued solid waste generation and poor disposal in municipal areas of Nigeria. *Journal of Geography, Environment and Earth Science International, 6*(3), 1–10. https://doi.org/10.9734/JGEESI/2016/26469

Muhammad, L. J., Badi, I., Haruna, A. A., & Mohammed, I. A. (2021). Selecting the best municipal solid waste management techniques in Nigeria using multi-criteria decision-making techniques. *Reports in Mechanical Engineering, 2*(1), 180–189. https://doi.org/10.31181/rme2001021801b

National Bureau of Statistics (NBS). (2019). *Estimates of waste generated in Nigeria (2000–2018)*: Technical dataset. Abuja, Nigeria: NBS.

Ogwueleka, T. C. (2009). Municipal solid waste characteristics and management in Nigeria. *Iranian Journal of Environmental Health Science & Engineering, 6*(3), 173–180. https://ijehse.tums.ac.ir/index.php/jehse/article/view/209

Okafor, C. C., Ibekwe, J. C., Nzekwe, C. A., & Ajaero, C. C. (2022). Energy and material recovery potential from municipal solid wastes (MSW) in Nigeria: Challenges and opportunities. *Clean Technologies & Recycling, 2*(4), 282–307. https://doi.org/10.3934/ctr.2022015

Okafor, C. C., Ibekwe, J. C., Nzekwe, C. A., & Ajaero, C. C. (2022). Estimating emissions from open-burning of uncollected municipal solid waste in Nigeria. *AIMS Environmental Science, 9*(2), 140–160. https://doi.org/10.3934/environsci.2022011

Omokaro, G. O., Michael, I., & Evgenievich, P. V. (2024). Assessing the environmental and health implications of waste disposal: A case study of Africa's largest dumping site. *Journal of Geography, Environment and Earth Science International, 28,* 16–30. https://doi.org/10.9734/jgeesi/2024/v28i5767

Onwualu, P. N., & Iroegbu, C. (2021). Assessment of municipal solid waste management practices in Port Harcourt, Nigeria. *Journal of Environmental Management.*

Onyishi, C. J., Wali, E., & Okwakpam, I. O. (2023). Solid waste management system in Enugu Metropolis, South-Eastern Nigeria. *Journal of Geography, Environment and Earth Science International, 27*(6), 1–15. https://doi.org/10.9734/jgeesi/2023/v27i6687

Salami, H. A., Adegite, J. O., Bademosi, T. T., Lawal, S. O., Olutayo, O. O., & Olowosokedile, O. (2019). A review on the current status of municipal solid waste management in Nigeria: Problems and solutions. *Journal of Engineering Research and Reports, 3*(4), 1–16. https://doi.org/10.9734/jerr/2018/v3i416884

World Bank. (2018). What a waste 2.0: *A global snapshot of solid waste management to 2050. The World Bank.* https://datatopics.worldbank.org/what-a-waste/

World Bank. (2020). *Improving solid waste and plastics management in Lagos (project note/dataset). The World Bank.* https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099101824172020522