

**THE ASSESSMENT REPORT OF GAPS AND NEEDS OF SOLID
WASTE MANAGEMENT IN NIGERIA**

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1. INTRODUCTION

This report aims to map out the Solid Waste Management (SWM) legal framework and analyze the gaps and needs of the waste management in Nigeria, focusing on Abuja city of the Federal Capital Territory (FCT) as a case study. Due to Abuja unique status, most laws that govern it are national, as the city does not have local waste management policies. The absence of these localized laws presents unique challenges for waste management, particularly the informal waste workers who operates outside the formal regulatory frameworks. This backdrop the basis of our analysis, which explores the legal, institutional, and operational aspects of Abuja’s waste management system and proposes recommendations for improvement which will inform effective policy changes to address the country's waste management challenges. These endeavors align with Output (1) as stipulated in the Terms of Reference within the contract between the United Nations and Oluwaseyi Ebenezer.

This report is structured into ten chapters, each addressing a specific aspect of the solid waste management system in Nigeria FCT:

- **Chapter 1: Introduction**

The chapter introduces the context of the report, setting out the background of waste management in Nigeria and its national legal framework. It outlines the objectives and scope of the study, explaining why legal mapping, gap analysis, and need assessment are essential to improving waste management in Nigeria.

- **Chapter 2: Methodology**

This chapter provides a detailed explanation of the research methodology used, including the doctrinal legal approach and desktop research. It also describes how primary and secondary data were collected and analyzed to provide insights into the current waste management framework in Nigeria FCT.

- **Chapter 3: Conceptual Framework**

This section discusses the theoretical foundations that guide the analysis, including key models and concepts relevant to waste management. The chapter defines important terms and provides a lens through which the legal and institutional framework of solid waste management is examined.

- **Chapter 4: Legal Framework of Solid Waste Management**

The section explores the existing legal provisions governing solid waste management in Abuja, including their historical development. It highlights the implications of the fact that Abuja does not have localized waste management examines key national provisions relevant to the city.

- **Chapter 5: Institutional Framework for Solid Waste Management**

The chapter identifies and analyzes the roles of various institutions involved in waste management in Nigeria FCT. It assesses the effectiveness of their coordination and the institutional challenges that affect the overall waste management efforts, particularly the integration of informal waste workers.

- **Chapter 6: Overview of Legal Mapping Findings**

The chapter summarizes the key findings from the legal mapping exercise, identifying the strength and weaknesses of Nigeria's waste management laws. It highlights the major themes and issues uncovered during the analysis of the existing legal framework.

- **Chapter 7: Identification of Gaps in Waste Management Practices**

The section analyzes the gaps in the Nigeria FCT's waste management practices, particularly in relation to the implementation of the existing laws and policies. It defines the challenges such as lack of effective enforcement and the exclusion of informal waste workers from the formal systems.

- **Chapter 8: Needs Assessment**

Based on the gaps identified, this chapter outlines the infrastructure, policy, technological, and socioeconomic needs required to improve waste management in Nigeria. It includes a focus on the needs of informal waste workers and highlights the resource and capacity gaps that need to be addressed.

- **Chapter 9: Recommendations for Improving Waste Management**

This chapter provides actionable recommendations to address the gaps identified in the previous chapters. It includes proposals for policy reforms, institutional strengthening and strategies to integrate informal waste workers into the formal waste management system.

- **Chapter 10: Conclusion**

The final chapter recaps the main findings and recommendations of the report, offering a summary of how improved coordination, infrastructure, and legal reforms can contribute to a more sustainable and inclusive waste management system in Nigeria. The outline guides the reader through the logical progression of the report, from the background and methodology to the analysis of legal and

institutional frameworks, culminating in actionable recommendations for improving waste management in Nigeria.

1.1 Background and Context:

1.1.1 Overview of Waste Management Importance

1.1.2 Current Challenges in Waste Management:

There are various challenges besetting the issue of solid waste in Nigeria. Although Nigeria has ratified the African Charter on Human and Peoples' Rights (ACHPR), the Constitution renders environmental protection non-justiciable.

Another challenge is the lack of modern techniques in waste disposal (Kadafa, 2017). Most households seldom utilized municipal dumps. They prefer to burn, bury, and dump the waste arbitrarily. Concept like recycling however, is beginning to gain traction with respect to plastics (Kehinde, Ramonu, Babaremu, and Justin, 2020).

Waste management techniques in developed nations are advanced, but Nigeria like most developing countries face challenges due to population growth, industrialization, and migration. In Nigeria, unplanned settlements, traffic congestion, ignorance, insecurity, poor policies, and inability to enforce environmental laws contribute to waste generation in shantytowns and urban areas (Noiki A. A. et al. 2021).

Another challenge is making it challenging to invest in unique waste management infrastructure and technologies (Brammah, 2023).

Also, there is a lack of awareness of the advantages of a circular economy and the need to reduce waste. This lack of environmental awareness leads to unhealthy environmental practices like indiscriminate burning (Brammah, 2023). There is need to invest in knowledge about the environment and the need for the government to not only educate them about the dangers of careless environmental practices but also, the legal implications. This ties to the next legal challenge which is the inefficacy of the punishment stated in these laws. These punishment for breach is so trivial that they cannot be used as deterrence to offenders.

Emerging issues in respect to solid waste management include recycling of waste and electronic waste (Kadafa, 2017). As has been stated above, Nigeria has not developed a robust framework for e-waste in the country. There is therefore need for Nigeria to address this issue whilst nascent. Failure to do this will only compound our tackle of solid waste management in Nigeria. This analysis is crucial because having laws in place is not enough to ensure effective waste management; enforcement and implementation are equally important. Without the proper execution of these laws, their potential impact is significantly diminished. Effective enforcement mechanisms and implementation strategies are necessary to translate legal provisions into real-world practices that can address waste management challenges. It is essential to provide comprehensive information about the key challenges related to the effective implementation of waste management laws and policies, including relevant recommendations tailored to Nigeria's specific circumstances.

Enforcement of the Revised EE Regulation:

The revised regulation legally requires EPR subscriptions and prohibits suboptimal e-waste treatment. It has shown some progress in the implementation that made the EPR provision to be operationalized in the sector.

The regulation provides a legal framework for the effective e-waste management and promote the adoption of circular economy principles across the country. Through the provisions of the Regulation, the EPR Guidance document for the Electrical and Electronics sector has been in use, it defines the roles and responsibilities of the critical public and private stakeholders, the product categories to be covered by the EPR scheme, and the collection and recycling targets.

Pollution has reduced due to the efforts of the government and the sector PRO, however, the effectiveness of enforcement in preventing and minimizing pollution remains a challenge. Non compliance and low registration (with NESREA and the PRO) especially from the informal sector has been of great concern. This highlights the need for stricter compliance and enforcement to ensure proper waste management practices.

To improve implementation, concerted efforts are necessary at both state and federal levels. Some potential strategies include

- Strengthening Registration and Compliance: Ensuring all e-waste collection centers register with NESREA and adhere to guidelines.
- Public Awareness and Education: Increasing awareness among consumers about proper e-waste disposal practices.

- Private Sector Engagement: Encouraging private sector investment in recycling plants and waste management infrastructure.
- Effective Waste Collection and Disposal: Implementing efficient waste collection systems and ensuring proper disposal of non-recyclable waste.

Overall, while the regulation is a step in the right direction, effective enforcement and public-private collaboration are crucial to minimizing pollution and promoting sustainable waste management practices in Nigeria.

1.2 Objectives of the Assessment:

1.2.1 Understanding the Current State:

The primary objective of this report is to understand the current state of the waste management legal framework in Abuja, Nigeria. The specific objectives are to:

the existing legal and institutional frameworks governing waste management in Nigeria, specifically its Federal Capital Territory where Abuja metropolis is located. This involves analyzing existing laws, regulations, policies, and international conventions that Nigeria has ratified, along with the institutional arrangements governing waste management.

1.2.2 Identifying Gaps and Needs

Identify the gaps for solid waste management in Abuja and proffer need assessment for tackling these shortcomings the focus is on identifying the critical gaps and needs within the Nigeria's FCT waste management system.

Therefore, in this section the aim is to highlight the specific deficiencies that hinder the effective and sustainable management of solid waste. A comprehensive methodological approach is employed to address the following key gaps:

Infrastructure Gaps: Lack of waste collection stations, outdated landfills, and insufficient recycling facilities limit Abuja's capacity to manage the growing waste

generation efficiently. The absence of modern waste processing infrastructure is a significant barrier to sustainable waste management.

Transportation Gaps: Delays and inefficiencies in waste transportation due to a lack of vehicles and outdated transportation infrastructure pose significant challenges. Addressing this gap is crucial to ensuring timely waste collection and disposal.

Regulatory Gaps: Abuja's waste management is governed by national laws, with no localized policies. This results in gaps in enforcement and inadequate alignment with the city's specific waste management needs. There is also insufficient coordination between regulatory agencies, leading to ineffective implementation.

Technological Gaps: Limited use of modern technology, such as digital waste management systems, smart sensors, and mobile apps, prevents the optimization of waste collection and processing. Technological innovation can significantly improve the efficiency of waste management but remains underutilized.

Socioeconomic Gaps: Informal waste workers, who play a vital role in the waste management system, face challenges like marginalization, lack of legal recognition, and poor working conditions. The absence of social inclusion, training, and financial support for these workers further exacerbates these issues.

Through this multi-method approach, the research identifies the core gaps in Abuja's waste management system and highlights the pressing needs, particularly for informal waste workers, to ensure a more sustainable and inclusive waste management system.

1.3 Scope of the Assessment

1.3.1 Legal Framework

From the legal and institutional perspective, this report focuses on the legal aspects of waste management, including laws, regulations, policies, and institutional arrangements operational in Nigeria at the Federal Level.

1.3.2 Geographical Coverage

The geographical setting of this work is Nigeria; however, the report is limited to waste management practices and governance in Abuja, one of the metropolises in the Federal Capital Territory (FCT) of Nigeria. Abuja was established in 1976, and it is the capital of the FCT. Consequently, the geographical limits and reflects the applicable extant laws in this report.

1.4 Significance of the Assessment

1.4.1 Policy Relevance

By examining the current regulatory and institutional frameworks governing waste management in Nigeria, the study will provide valuable recommendations for policymakers. The findings will provide valuable insights for policymakers and government agencies to improve waste management policies and regulations in Nigeria. Consequently, it will help in formulating and enforcing laws, regulations, and policies that enhance waste management efficiency and accountability.

1.4.2 Actionable Recommendations

Solid waste management affects urban aesthetics, sanitation, and the overall liveability of a city. This study will help foster a cleaner, healthier, and more organized urban environment, improving the social well-being and satisfaction of Nigerian inhabitants. The outcomes of this research will serve as a foundational resource for urban planners and city administrators in designing and implementing integrated solid waste management systems that accommodate Nigeria's growing population and urban expansion.

1.4.3 Stakeholder Collaboration

This study will identify knowledge and skill gaps among stakeholders involved in waste management, including policymakers, private sector operators, and the . It will propose capacity-building initiatives and awareness campaigns to foster a culture of responsible waste generation and disposal.

1.5 Conclusion

The introduction concludes by outlining the objectives of the report, which include assessing the state of waste management in Nigeria, with Abuja as a case study, pinpointing areas for improvement, and proposing actionable recommendations. It emphasizes the importance of considering Abuja's unique legal and governance framework in developing effective waste management solutions for Nigeria. It also sets the stage for the gap analysis and needs assessment of the waste management legal framework in Nigeria at the federal level, providing context, objectives, scope, and significance of the assessment. Subsequent sections will delve into the findings and recommendations based on the assessment outcomes.

2. **METHODOLOGY**

2.1 Introduction

This chapter outlines the systematic approach used to examine and evaluate the legal framework for solid waste management (SWM) in Nigeria at the Federal Level, with Abuja as the case study. The methodology combines doctrinal legal research, secondary data collection, desktop research, and stakeholder consultations, and the integration of the findings from the Waste Wise Cities Tool (WaCT) report by UN-Habitat. Each component ensures a robust and comprehensive understanding of the current SWM practices, legal structures, and on-the-ground realities in Nigeria.

2.1.1 Purpose of Methodology Section

This section outlines how data were gathered, analyzed, and synthesized to provide a credible basis for the study's findings. By detailing each methodological step, the report ensures transparency, enabling readers to understand and potentially replicate the research process.

of Approach

A multi-layered approach was adopted:

- A. Doctrinal legal research to examine primary legal sources.

- B. Secondary data collection and desktop research to contextualize and supplement legal findings.
- C. Stakeholder consultations to validate insights from documentary sources.
- D. Review of WaCT (Waste Wise Cities Tool) report by UN-Habitat to incorporate specialized, data-driven findings into the analysis.

2.2 Primary Data Collection

The primary goal was to identify the existing legal framework for SWM in Nigeria at the federal level with particular focus on Abuja to understand how these laws apply in practice and highlight any deficiencies or overlaps.

: Doctrinal Legal Approach

A. Examination of Legal Texts:

- Constitutional provisions related to the Environment.
- Federal statutes (e.g. NESREA Act, EIA Act) and accompanying regulations.
- Relevant policy documents and guidelines.

B. Analysis of Judicial Decisions

- Any precedent-setting cases on waste management or environment breaches to interpret legal enforcement and judicial perspectives.

The doctrinal approach ensures a structured, in-depth review of laws and regulations governing waste management, pinpointing where legislative reforms may be needed to enhance SWM effectiveness in Nigeria.

2.3 Secondary Data Collection

To complement the doctrinal review by offering theoretical, comparative, and policy-focused insights on solid waste management trends and best practices.

A. Comparative Literature Review:

- Textbooks, peer-reviewed journal, policy briefs, and technical studies to gather academic and practical perspectives.
- Comparative analyses from other jurisdictions to benchmark Nigeria's SWM policies and legislative models.

and Institutional Reports:

- Government documents highlighting previous reforms or ongoing initiatives.
- Reviews of the international standards, including those from UNEP, -Habitat, and the World Bank.

Secondary data collection situates Nigeria's SWM within a broader context, identifying lessons from international experiences, scholarly debates, and emerging trends that may inform the reform process.

2.4 Desktop Research

To assemble empirical data, statistics, and official records that illustrate the operational realities of SWM in Nigeria at the federal level.

A. Online Database and Government Websites:

- Gathering up-to-date information on SWM infrastructure, budget allocations, and compliance records.

B. Institutional Repositories:

- Accessing research outputs and unpublished materials from federal agencies, academia, and non-governmental bodies.

C. Integration of WaCT Findings:

- Waste Wise Cities Tool (WaCT) by UN-Habitat: This specialized tool provides data-driven insights on current waste generation rates, collection efficiency, recycling practices, and financial assessments.
- Incorporating WaCT findings into analysis helps validate existing data, identify policy gaps, and propose relevant strategies for improvement.

Desktop research, enriched by the WaCT report, provides a factual grounding to the study, enabling a more precise understanding of the SWM performance, infrastructural capacities, and the efficacy of existing policy measures in Nigeria.

2.5 Stakeholder Consultations

Recognizing the importance of real-world perspectives, key stakeholders were engaged to validate and expand upon the findings from the doctrinal, secondary, and the WaCT data reviews. These consultations

- Federal Institutions: Federal Ministry of Environment, NESREA, Federal Ministry of Health, Abuja Environmental Protection Board (APEB) etc.
- Regulatory bodies and civil society organizations: offering practical insights on enforcement and advocacy.
- Community Representatives and Waste Management Managers: Including in formal waste workers who experience gaps and needs firsthand.

A validation workshop, coordinated by NESREA, served as a platform for stakeholders to review initial findings, provide feedback on perceived challenges, and confirm priority areas for policy reforms.

2.6 Connection to Objectives

- **Doctrinal Analysis:** Directly addresses the objective of evaluating existing legal frameworks and identifying legislative gaps.
- **Secondary Data & Desktop Research:** Offers a broader perspective on policy effectiveness, comparative insights, and real-world data, aligning with the goal of understanding broader contextual factors.
- **Stakeholder Consultations:** Ensures that the study's conclusions are grounded in practical reality and validated by those directly involved in or affected by SWM system.

2.6.2 Contribution

This combined methodology provides

- A. Legal Clarity:** A thorough mapping of how federal laws apply in Abuja and where reforms are needed.
- B. Contextual Understanding:** Insights from literature, data, and WaCT ensure recommendations are informed and actionable.
- C. Grounded feedback:** Stakeholder perspectives verify the relevance of the identified gaps and proposed solutions.

By integrating a doctrinal legal approach, extensive literature review, desktop research - including the WaCT findings- and stakeholder consultations, this chapter establishes a robust framework for analyzing SWM practices and legal landscape in Nigeria particularly in subsequent section builds upon these methodological foundations to propose evidence-based recommendations aimed at strengthening Nigeria's legal framework and optimizing waste management in the country.

3. CONCEPTUAL FRAMEWORK

3.1 Generation and Classification of Waste

Solid waste covers discarded materials that are no longer required by the owner or user. Solid waste includes materials that are in a solid or liquid state but excludes wastewater and small particulate matter released into the atmosphere (United Nations, 2014). According to the U.S. Environmental Protection Agency (EPA), solid waste is any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. Solid waste generation rates and composition vary from country to country depending on the economic situation, industrial structure, waste management regulations and .

Nigeria annual Municipal Solid Waste (MSW) generated from its national population is over 32 million tons yearly, and only a fraction of about 20-30% is collected (Bakare, 2020). Most of these wastes are generated by households and in some cases, by local industries, artisans and traders who litter the immediate surroundings. Improper collection and disposal of municipal waste has led to different levels of environmental challenges, such as the blockade of sewers and drain networks and the choking of water bodies (George, 2010). In Nigeria, municipal waste densities generally range from 250-370 kg/m³ (Olukanni and Mnenga 2015); the waste generation rate is 25 million tons annually and at a daily rate of 0.44kg - 0.66 kg/capital/day (Ogwueleka, 2009) Africa region is growing rapidly, whereby in 2050, the total waste generated is expected to triple, double, and double; respectively According to the World Health , the low-income countries generate approximately 0.5 kg to 3 kg of total health care waste per year by an individual. The per capita solid waste generation in developed countries like Canada, Switzerland, France, United Kingdom and USA varies between 0.9 – 2.7kg per day and in the developing countries like India, Sri Lanka and Thailand generates 0.3-0.65kg, 0.4-0.85kg and 0.5-1kg per day (Korner, 2003-2006). From the total quantity of waste generated in Canada, nearly 50% is municipal solid waste.

A report from the US Environmental Protection Agency (USEPA) shows that 56.9% of total waste generated in the USA is disposed of in landfills, 27% is material recycled and 16.1% is incinerated (Kuniyal, 2010). Emmanuel *et al.*, 2018 listed the different categories of solid wastes generated in Nigeria according to literature reviewed in the table below.

Authors	Categories	Classifications
Igwe <i>et al.</i> , 2002	Trash, Metals, Glass, Polyethylene and Plastics, and Biodegradable	Biological, Chemical and Physical character
Oyelola and Babatunde, 2008	Classification Paper, Putrescible, Nylon, rubber and Plastic, Metals, Glass, and Garden waste	Biological, Chemical and Physical character
Kadafa <i>et al.</i> , 2012	Paper, Metal, Glass, Plastic, Food remnants, Textile, Rubber, Others and Person/ household	Biological, Chemical and Physical character
Babatunde <i>et al.</i> , 2013	Organic, Paper, Plastics, Metals, Glass, Nylon and Others	Biological, Chemical and Physical character
Okey <i>et al.</i> , 2013	Plastic, Paper, Metal, Glass, Textiles and Others	Biodegradable materials, biodegradable and Nonbiodegradable waste
Ogu <i>et al.</i> , 2014	Paper, Plastic materials, Glass/ Bottle, Nylon/ Polythene, Metals/ Cans, Textile materials, Food waste, Ashes, Animal dung, Garden waste/ Leaf and Special waste	Biological, Chemical and Physical character
Abur <i>et al.</i> , 2014	Food, Paper, Iron, Glass, Rubber, Plastic and Others	Biological, Chemical and Physical character

Butu and Mshelia, 2014	Tins, Plastics, Bottles, Food waste, Ash, Dirt and Vegetables	Biodegradable and wastes
Audu <i>et al.</i> , 2015	Paper, Metal, Glass, Organics, Plastics, Nylon, and Others	Biological, Chemical and Physical character
Bovwe <i>et al.</i> , 2016	Organic, Plastics, Paper, Glass, Metal, Textile/Leather and Unclassified Debris	Biological, Chemical and Physical character

Source: Emmanuel *et al.*, 2018

3.2 Waste Management Practices

This section will provide the foundational principles that guide waste management practices, focusing on the Integrated Waste Management (IWM) approach. It will draw on globally recognized frameworks, including the UNEP Guidelines for Framework Legislation for Integrated Waste Management, to establish a conceptual understanding of waste management in Nigeria.

3.2.1 *Integrated Waste Management (IWM) Approach*

IWM systems combine waste streams, collection, treatment, and disposal technologies to provide a waste management system that is economically feasible, environmentally sustainable, and socially acceptable (Nordone et al). To achieve this, waste reduction, reuse, recycling, decomposition, bio-gasification, thermal treatment, and landfilling are integrated. The integration of waste management choices into a cohesive strategy should be valued over the amount or simultaneous use of different solutions. IWM examines the entire system to discover the most effective treatment techniques for social and environmental benefits and decreasing costs.

3.2.2 *Waste Hierarchy*

This reducing, reusing, and recycling waste before considering disposal methods like incineration and land filling. This principle is essential for managing waste

sustainably and reducing the environmental footprint of Nigeria's waste management system.

3.2.3 Sustainability

Effective waste management practices aim to minimize environmental impact while promoting social equity and economic viability. This involves considering long-term impacts and the health of ecosystems. **Financing:** Financial mechanisms that support waste management activities, including investments in waste infrastructure, technology, and workforce. This will tie into the identified financial gaps in Nigeria FCT's waste management system.

3.2.4 Public Health and Safety

Waste management must protect the health of communities and ecosystems. This includes proper handling, treatment, and disposal of hazardous waste to prevent contamination and health risks.

3.2.5 Polluter Pays Principle

The idea that those who generate waste should bear the costs of its management. This will be key for encouraging responsible waste disposal and involving producers in reducing waste generation at the source. This principle encourages responsible behaviours and cost accountability.

3.2.6 Extended Producer Responsibility (EPR)

Holding manufacturers responsible for the life cycle of their products, including the post-consumer phase, which encourages companies to design products that are easier to recycle or dispose of responsibly.

3.2.7 Community Engagement

Involving local communities in waste management decisions and practices is crucial. Education and participation can enhance compliance and foster a sense of ownership over waste issues.

3.2.8 Precautionary Principle

Advocates taking preventative action in the face of uncertainty to avoid environmental damage. This principle guides policy implementation, especially in cases where waste could cause unforeseen environmental impacts.

This section sets the stage for understanding Abuja's waste management needs within the broader international framework, ensuring that the approach aligns with UNEP guidelines and other global best practices.

3.3 Standard Practices in Developed Regions

Developed regions like Europe and the USA have waste management methods for different kinds of waste and defined policies and legislation especially knowledge of waste and its impacts. In developing countries like India and Thailand, virtually all of the generated waste is landfilled. This difference in waste handling depends on lack of knowledge on waste and its impacts on environment and human health, improper collection system for waste, lack of policies and measures for waste management, unavailability of recycling options and lack of infrastructure (Nagabooshnam, 2011).

Like other developing countries all over the world, Nigeria is also facing the serious issue of increasing solid waste generation and out of the various methods of disposing waste such as composting, landfill and incineration and open dumping, the most available method here in Nigeria is open-dumping and landfills (Nwosu and Chukwueloka, 2020). In many cities in Nigeria, wastes are usually dumped on the streets, or abandoned buildings (Butu and Mshelia, 2014) where they produce heaps of trash with foul or offensive odour, obstruct traffic and pose serious health challenges on humans; Some of which may get into drainages and overtime cause flooding, and blockage of drainage systems in the city.

To effectively embrace circularity and drive technological innovation, it is essential to consistently reference exemplary practices that can serve as a model for implementation. For instance, according to the 2024 UNDP Report (2024) in Africa Green Business and Financing Report, "Many African countries have taken positive steps towards adopting innovative waste disposal infrastructure and management

technologies. An excellent example is the decision taken by the Ethiopian government in 2017 to transform the Koshe dumpsite into a waste-to-energy facility. The facility is capable of processing and incinerating more than 1,400 tonnes of waste per day. Nearly 80 percent of Addis Ababa's waste is now redirected for energy production, contributing about 30 percent of domestic electricity needs. The Kenyan government has also launched initiatives in collaboration with private sector actors to adopt cutting-edge technologies on a large scale for purposes of waste management. Local authorities partnered with Taka Taka, a company engaged in numerous innovative waste management activities, to make waste collection services more accessible and affordable to poorer communities and to bolster recycling efforts to encompass approximately 90 percent of the total waste collected. This initiative has also created new jobs, particularly among women and young people”.

The prevailing challenge of solid waste management in Nigeria, characterized by

widespread open dumping and , highlights the urgent need for a shift towards integrated sustainable waste management (ISWM) practices. Integrated waste management approaches offer a comprehensive framework to address the multifaceted issues associated with waste management while promoting sustainability. The Integrated waste management systems combine waste streams, waste collection, treatments and disposal methods into a practical waste management system that aims to provide environmental sustainability, economic affordability and social acceptance. This is achieved by combining a range of treatment options including waste reduction, reuse, recycling, composting, bio-gasification, thermal treatment and . Brazil is an example of a successful initiative that required a moderate investment in WM. Residents are reimbursed for recyclable waste and materials with fruits and bus tickets. This encourages the citizen to do more and better in solid waste management (World Future Energy Summit, 2024).

The current solid waste management system in Nigeria remains underdeveloped, inefficient, and unsustainable. This is evident in the limited availability of waste management facilities, restricted access to collection service, and low overall rates of waste collection. Waste is frequently dumped along on roadsides, in open pits, beneath bridges, and in drainage channels, reflecting a general disregard for potential health and environmental hazards.

Disposal practices rarely align with best practices, leading to uncontrolled waste piles in residential areas. These piles are often burned when they overflow or emit foul odors, contributing to air pollution. Additionally, haphazard refuse clogs sewers and drainage systems, sometimes causing eutrophication and obstructing water bodies.

Most Nigerian states do not maintain clear, unified policies on solid waste management; instead fragmented and loosely coordinated regulations prevail. Moreover, the absence of reliable statistics on national waste generation impedes

effective planning and infrastructure development across local, state, and federal levels. Establishing standardized data collection creating integrated databases - harmonized at the federal level- would significantly enhance evidence - based decision-making.

Finally, insufficient funding, inadequate technical capacity, and a poorly structured costing system undermine the efforts of state level and waste management agencies. It is thus important to invest in better financing mechanisms, capacity building and sustainability of Nigeria's solid waste management.

4. LEGAL FRAMEWORK OF SOLID WASTE MANAGEMENT IN NIGERIA

This chapter presents a comprehensive overview of the legal framework surrounding solid waste management in Nigeria highlighting the diverse range of laws, regulations, and policies aimed at addressing environmental protection and waste management challenges. It underscores the need for enhanced enforcement, legal clarity, and proactive measures to achieve effective waste management practices and environmental sustainability. This chapter will focus on the application at the national/federal level (Nigeria FCT international instruments, conventions, treaties, etc. to which Nigeria is a signatory).

4.1 The Constitution of the Federal Republic of Nigeria 1999 (as amended)

The Constitution of Nigeria is the legitimatizing framework for laws in Nigeria. By virtue of section 1(3) of the Constitution, any law that is inconsistent with the Constitution is, to the extent of its inconsistency, null and void. This provision makes the Constitution the most important law in the country and the need for legislatures to make laws that do not run of the provisions of the Constitution. To this end, the Constitution in Section 20, enjoins the government to protect the environment.

This provision, however, cannot be legally enforced against the government owing to the non-justiciability provision of the Constitution (Section 6(6)(c)). The non-justiciability clause can however be bypassed by either instituting the environmental suit under Chapter IV of the Constitution which states the fundamental human rights of every citizen in Nigeria or utilizing the regional legal framework provided by the African Charter (Yahaya and Kehinde, 2023).

It is equally worthy of note that the Constitution did not expressly mention the environment in the 68 items on the exclusive legislative list, neither is it clearly listed in the concurrent list. By virtue of *A.G. Federation v. A.G. Lagos State* (2013) LPELR-20974(SC) p. 93, paras A-G, the issue of the environment is on the residual list hence, states have the exclusive jurisdiction on environmental issues. This is however, an issue that must be reconsidered since environmental issue is not only a national issue but a cross-border phenomenon. The consequence, however, is that

States of the Federation may refuse to pass treaties that may have been entered on behalf of Nigeria.

4.2 Environmental Impact Assessment Act, 1992 Environmental Impact Assessment (EIA) is designed to evaluate and mitigate negative environmental effects of developmental projects. The object of the Environmental Impact Assessment Act (EIA) is to ensure that both private and public sectors assess the environmental impact of their projects before embarking on it (Sections 1 and 2). 'Project' is defined in the EIA Act as any 'physical work that a proponent proposes to construct, operate, modify, decommission, abandon or otherwise carry out or a physical activity that a proponent proposes to undertake or otherwise carryout' (Section 61).

Importantly, the EIA Act also needs to be amended to reflect the present enforcement agency since the Environmental Protection Agency which is stipulated to enforce the provisions of the Act has been replaced by the National Environmental Standards Regulatory and Enforcement Agency

4.3 National Environmental Standards Regulations and Enforcement Agency Act, 2007

4.4 The Harmful Wastes (Special Criminal Provisions, etc.) Act No 42 of 198.

The Koko incident spurred the promulgation of the Decree, now Act (Yahaya and Kehinde 2023). The Act proscribes the importation, transportation, and disposal of unlawful trash in Nigeria. It also improves environmental health by preventing the discharge of hazardous waste on land or in water. The Harmful Waste Act prohibits, without lawful authority, the carrying, dumping, or depositing of harmful waste in the air, land or waters of Nigeria (Section 1). Section 1(3) refers to the form of waste

which may be solid, semi-solid or liquid. Section 6 provides life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence. Section 7 However the Act does not have a clear provision for punishment. This sadly, runs foul and contrary to the provisions of Section 36(12) of the Nigeria Constitution. This is because Section 36(12) is to the effect that a person cannot be convicted unless the offence and punishment thereof is prescribed in a written law.

Sections 2-5 make provisions for the liability of the parties to the offence. The parties include the principal offenders, and accessories after the fact, conspirators, and abettors. The penalty is life imprisonment in accordance with Section 6 of the Act. Section 9 of the Act excludes immunity on persons protected under the Diplomatic Immunities and Privileges Act if they commit any crime under the Act. This provision is important because makes the environment the responsibility of everyone. Section 12 defines the civil liability of any offender offender would be liable to the person(s) who have suffered injury because of his offending act. Furthermore, the Act shows its commitment to discouraging harmful waste by excluding the provisions of section 25 of the Interpretation Act which prevents the accused from being tried under more than one law.

4.5 Criminal Code Act

The Criminal Code Act contains provisions the protection of public health hazards which has direct link with environmental protection in Nigeria. For instance, Section 245 provides that, any person who corrupt or fouls the spring, stream, well tank, and reservoir, *inter alia* is guilty of a misdemeanor, and is liable to imprisonment for six (6) months.

4.6 Merchant Shipping Act 2007

The Act makes provision with respect to shipping and the registration, licensing and marking of ships in Nigeria. The Act deals extensively with the governance and regulation of ships and its related issues in Nigeria. The Act contains provisions relative to the carriage of dangerous good by ships and the prevention of pollution from ships (Section 336). Section 336 also makes applicable maritime Conventions for the Prevention of Pollution from Ships. The Act also mandates a ship-owner to

remove a wreck determined to constitute a hazard (section 366). Section 435 also empowers the Minister make regulations generally for carrying into effect, the provisions of this Act. Specifically, Section 435(1)(s) empowers the Minister to make regulation for the prevention of pollution, by oil, of navigable waters.

Several issues hinder effective enforcement

- Limited Resources: NESREA and other regulatory agencies often lack the necessary resources, including funding, personnel, and equipment, to effectively monitor and enforce compliance.
- Corruption: Corruption within law enforcement agencies and government institutions can impede effective enforcement, allowing non-compliant activities to persist.
- Inadequate Infrastructure: Nigeria's waste management infrastructure is often inadequate, leading to improper disposal of hazardous waste and environmental pollution.
- Poor Public Awareness: Limited public awareness and education on environmental issues contribute to non-compliance and environmental degradation.
- Regulatory Overlap: Overlapping responsibilities among government agencies can lead to confusion and inefficiencies in enforcement.
- Insufficient Training: Enforcement officers may lack the necessary training and capacity to effectively enforce environmental laws.

To improve enforcement, Nigeria can³:

- Strengthen Regulatory Frameworks: Continuously review and update regulations to address emerging challenges.
- Increase Funding: Allocate more resources to enforcement agencies.
- Enhance Public Awareness: Educate citizens on environmental laws and regulations.
- Improve Training: Provide enforcement officers with necessary training and capacity-building.
- Promote Transparency and Accountability: Foster transparency and accountability in enforcement activities.

Some key agencies involved in environmental law enforcement in Nigeria include:

- NESREA: Primary agency responsible for enforcing environmental laws.
- Nigeria Maritime Administration and Safety Agency (NIMASA): Focuses on marine pollution prevention and control.
- National Emergency Management Agency (NEMA): Handles disaster management and response.
- National Orientation Agency (NOA): Supports public awareness and education on environmental issues.

Note:

NESREA has reviewed its Permitting and Licencing Regulations and other relevant regulations with respect to penalties

4.7 Nigerian Maritime Safety Administration (NIMASA) Act 2007.

The Act empowers the agency to make such regulations with the approval of the Minister and not inconsistent with NIMASA Act for such provisions as it considered appropriate in relation to the dumping of ship and shore generated waste in Nigerian waters; and removal of wrecks which constitute navigation risks and which is a threat

to the marine environment (Section 44). Section 45 prohibits ships under the Act from carrying harmful substances in packaged form except permitted under the Act.

4.8 Federal Environmental Protection Agency Act, 1988

fragmented

4.9 The National Oil Spill Detection and Response Agency Act 2005 (as amended, 2006)

The essence of the Act is to regulate the detection and response to oil spillage in Nigeria by establishing the National Oil Spill Detection and Response Agency (Sections 1 and 5). Section 6 of the Act penalizes oil spillers who fail to report or notify the agency of such spillage. The Act equally penalizes an oil spiller who fails to clean up the impacted site (Section 6).

4.10 National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations 1991

The National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations 1991 is now referred to as part of the regulations under the National Environmental Standards and Regulations Enforcement Agency (NESREA). Specifically, NESREA has developed and published various environmental regulations, including those related to solid and hazardous waste management.

Some relevant regulations include:

- National Environmental (Sanitation and Wastes Control) Regulations, S.I. No. 28, 2009: This regulation provides for waste control and environmental sanitation.
- National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations: Although the exact updated version isn't specified, the 1991 regulation has been updated, and NESREA oversees its implementation.

Additionally, NESREA has developed over 35 environmental regulations, including:

- National Environmental (Electrical/Electronic Sector) Regulations, S.I. No 79, 2022
 - National Environmental (Battery Control) Regulations, 2024
 - National Environmental (Food, Beverages and Tobacco Sector) Regulations, 2023
- #### 4.11 National Environmental (Sanitation and Waste Control) Regulation, 2009

The administered by the National Environmental Standards and Regulations enforcement Agency (NESREA) The Regulation covers the general sanitation of the

Abuja metropolis (Section 1) The Regulation also itemizes the duties and obligations of owners (Sections 10-19) Part 3(I) of the Regulation provides extensively for solid waste control in the FCT (Sections 23-34). Sections 71-93 provides copiously for the offences under the Regulation and Sections 94-104 More so within The Regulation is currently has been reviewed to address emerging environmental challenges, it is in the process of being gazette. The Regulation is effective and NESREA has the full capacity to enforce it. However, - Inadequate Funding: Insufficient funds limit the agency's ability to monitor compliance, investigate environmental violations, and enforce penalties.

- Lack of Modern Technology: Inadequate equipment and technology hinder effective monitoring and enforcement of environmental regulations.

- Inadequate Training: Personnel lack the necessary training to understand and implement complex environmental laws and policies.

- Inadequate Public Awareness: Low awareness about environmental laws and their importance allows environmentally harmful practices to continue unchecked.

- Resistance from Powerful Individuals: Powerful individuals and groups, including those in government, often resist or interfere with enforcement efforts.

- Limited Capacity: NESREA's limited capacity to enforce compliance, particularly in the oil and gas sector, where it lacks enforcement powers.

- Lack of Mandatory Disclosure: Industries are not required to disclose information about their environmental impact, making monitoring and enforcement challenging.

4.12 National Environmental Protection (Pollution Abatement in Industries and Facilities generating waste) Regulations OPO1991

These Regulations, made under section 40 of the repealed Federal Environmental Protection Agency Act. The Regulations regulate the discharge of hazardous or toxic substances into the air, water, or land of Nigeria's ecosystems beyond limits approved by the Federal Environmental Protection Agency by industries (Section 1). Discharge, including solid, gaseous, and liquid waste from any industry or facility shall be

analyzed and reported to the nearest office of the Federal Environmental Protection Agency every month, through a Discharge Monitoring Report (Section 3) and unusual discharge or accidental discharge of waste shall be reported within 24 hours, (Section 4).

In addressing solid waste, section 16 of the Regulation provides Solid wastes to be disposed of in environmentally safe manner, and that no industrial solid waste shall be disposed of in any municipal landfill. Any person who contravenes any provision of these Regulations shall be guilty of an offence and liable on conviction to the penalty specified in section 35 or 36 of the Act (Section 22). It is worthy of note that FEPA has however been repealed by the NESREA Act.

4.13 The National Environmental (Electrical/Electronic Sector) Regulations 2011

The Regulation is made pursuant to section 34 of the NESREA Act. The purpose of the Regulations is to prevent and minimize all forms of pollution from the operations of the electrical or electronic sector. The Regulation enjoins body corporate to devise mechanisms for combatting pollution and maintain equipment in case of emergency (Section 5). Section 7 of the Regulation makes body corporate financially responsible for the pollution they caused – polluter pays principle. Conversely, the Regulation encourages the adoption of best practices to yield economic, social, and environmental values (sections 8 and 9).

Section 13 provides for the management of oil station and fuel dump sites to prevent the contamination of ground water. Part III of the Regulations prescribes the handling and control of e-waste (section 34). Sections 61-66 provide for the various offences under the Regulations. However, section 70 provides for the punishment of fine or imprisonment or both for the contravention of the offence sections. It is pertinent to state that this Regulation does not however regulate solid waste.

4.14 National Environmental (Base Metal, Iron and Steel Manufacturing/Recycling Industries Sector) Regulations, 2011

The Regulation is made pursuant to section 34 of the NESREA Act. The purpose of the Regulations is to prevent and minimize all forms of pollution in the sector. The

Regulation enjoins body corporate to devise mechanisms for combatting pollution and maintain equipment in case of emergency (Section 4). Section 6 of the Regulation provides for the applicability of the polluter pays principle. Conversely, the Regulation encourages the adoption of the 5 Rs which are: Reduce, Repair, Reuse, Recycle and Recover in the management of scraps generated during production (section 7).

Section 8 mandates organisation to prepare a voluntary action programme for global warming control measures. Such measures shall consider energy-saving and best available technology in their production processes. Sections 50-55 provide for the various offences under the Regulations. However, section 56 provides for the punishment of fine or imprisonment or both for the contravention of the offence sections. It is also worthy of note that the Regulation does not expressly regulate solid waste.

4.15 National Environmental (Pulp and Paper, Wood and wood products sector) Regulations, 2013.

The Regulation is made pursuant to section 34 of the NESREA Act. The purpose of the Regulations is to prevent and minimise all operations and ancillary activities of the sector in the Nigerian Environment (Section 1). The Regulation enjoins body corporate to devise mechanisms for combatting pollution and maintain equipment in case of emergency (Section 4)

Section 6 of the Regulation provides for the applicability of the polluter pays principle. Conversely, the Regulation encourages the adoption of best practices to yield economic, social, and environmental values (section 7). Section 16 provides for the management of oil station and fuel dump sites to prevent the contamination of ground water. Sections 50-55 provide for the various offences under the Regulations. However, section 56 provides for the punishment of fine or imprisonment or both for the contravention of the offence sections.

4.16 National Environmental (Motor Vehicle and Miscellaneous Assembly Sector) Regulations 2013.

This Regulations is made pursuant to the NESREA Act; and is aimed at preventing and minimizing pollution and wastes caused by all activities of the motor vehicle sector to the Nigerian environment (Section 1). The Regulations require a facility to submit an environmental impact assessment, an environmental management plan, an emergency plan, and a stock of pollution response equipment (Section 3). Matters covered by the Regulations include but not limited to application of the Polluter Pays Principle to every facility (Section 5); implementation of best practices and waste minimization (section 6); ban and restriction on chemical materials (section 8); vehicle waste handling (section 34). Section 53 creates several offences like failure to make provision for end-of-life collection, contravention of permit condition etc. Section 59 provides for penalties – fine or imprisonment or both for the offences stated in the Regulations.

4.17 National Sea Dumping Regulations 2013

These Regulations are made pursuant to sections 335(1) and 435 of the Merchant Shipping Act, 2007. The Regulations are administered by the Nigerian Maritime Administration and Safety Agency (NIMASA). The objectives of these Regulations are to give effect in Nigeria to the 1996 Protocol on the Convention on Prevention of Marine Pollution by Dumping of Wastes; and set out rules and operational guidelines for issuance of dumping permits penalties for breach (Regulation 1).

Regulation 3 prohibits the dumping of wastes without a permit, incineration of waste at sea and the export of wastes to other countries for dumping or incineration at sea. Regulation 4 permits the dumping of waste where it is necessary to protect human life, vessels, aircraft, and where there is every probability that the damage consequent upon such dumping will be less than would otherwise have occurred. The onus of proving the exception is on the master or owner of the ship (Reg 4(2)).

Also, the Agency may issue a permit as an exception to regulation 3 of these Regulations in emergencies (Reg 4(3)). Regulation 5 empowers the agency to grant permit for the dumping of waste at sea. Regulation 6 creates an offence where a

person contravenes the condition imposed in respect of the permit; an offence under this regulation is punishable, on conviction, by imprisonment for a term of not more than 2 years or a fine of not less than ₦10,000,000.00, (Ten Million Naira) or both.

Regulation 8 also penalises the making of false statement in the application for permit. Liability under this Regulation is a term of imprisonment not exceeding 2 years or a fine of not less than ₦10,000,000.00 (Ten Million Naira) or both. Further penalties for offences in the Regulations are equally stipulated in Regulation 9.4.18

The National Guidelines and Standards for Environmental Pollution Control in Nigeria 1991.

The Federal Environmental Protection Agency issued the Guidelines and Standards pursuant to Section 6(g) of the Federal Environmental Protection Agency Act. These guidelines and standards relate to six (6) areas of environmental pollution control: Effluent limitations (ii) Water quality for industrial water uses at point of in-take (iii) Industrial emission limitations (iv) Noise exposure limitations (v) Management of solid and hazardous wastes (vi) Pollution abatement in industries.

Under part II of the Guidelines, solid wastes generated by industry including, sludges and all bye-products resulting from the operation of pollution abatement equipment shall be disposed of in an environmentally safe manner as prescribed in these guidelines. Under no circumstance should any of these substances be co-disposed in any municipal landfill.

4.19 Environmental Guidelines and Standards for Petroleum Industry in Nigeria 1991

This guideline regulates solid waste in the petroleum industry. Article 3.2.1 provides for the Construction of new Treatment Systems or modification of existing ones for solid wastes *inter alia* shall be approved by the Director of Petroleum Resources from design to commissioning stages. Environmental Impact Assessment as appropriate shall accompany the application for Environmental permit to construct or modify. Article 3.6.4.1 provides that the disposal of solid wastes shall be by methods that will not endanger human life and living organisms and cause significant pollution. Article

3.4.1 also regulates the discharge of solid waste directly or indirectly into swamp, inland waters among others.

4.20 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

The Basel Convention was adopted on the 22 March 1989 and it came into force in 1992. It is the most comprehensive global environmental agreement on hazardous wastes and other wastes (UNEP, 2011). Nigeria is a party by virtue of executive ratification of the Convention. The Convention aims to protect human health and the environment against the adverse effects resulting from the generation, transboundary movements and management of hazardous wastes and other wastes. Article 1 of the Convention provides for the scope of wastes covered by the Convention. Article 4 obliges parties exercising their right to prohibit the import of hazardous wastes or other wastes for disposal shall inform the other Parties of their decision pursuant to Article 13. Article 6 provides for the procedure for transboundary movement between state parties.

The Basel Convention regulates the transboundary movements of hazardous wastes and other wastes and obliges its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner (Preamble to the Convention). The Convention covers toxic, poisonous, explosive, corrosive, flammable, Eco toxic and infectious wastes (Annex to the Convention). Basel Convention was designed to reduce the movement of hazardous waste between nations specifically the transfer of hazardous waste from developed to less developed countries. Nigeria having ratified this Convention has continued to take steps to fulfill its obligations, part of which was the set-up of the Basel Convention Regional Coordinating Centre and Technology Transfer Linkage Centre (BCRCC) in Ibadan Nigeria. s

4.21 Bamako Convention 1998 - On the Ban on the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Waste within Africa.

The Bamako convention is a supranational law. The Convention covers more wastes than the Basel Convention as it not only includes radioactive wastes but also considers any waste with a listed hazardous characteristic or a listed constituent as a

hazardous waste (UNEP). Despite it being an improvement of the Basel Convention, Nigeria signed the Bamako Convention in February 2008 and is yet to ratify it. (IPEN, 2018).

State Parties are enjoined to take appropriate legal, administrative, and other measures within the area under their jurisdiction to prohibit the import of all hazardous wastes, for any reason, into Africa from non-Contracting Parties (Article 4). Article 9 of the Convention makes illegal traffic any transboundary movement of hazardous wastes under the conditions stated in this Convention. Article 10 enjoins intra-African co-operation with relevant African organizations to improve and achieve the environmentally sound management of hazardous wastes.

4.22 Montreal Protocol on Substances that deplete the Ozone Layer 1987

The Protocol is an agreement aimed at protecting the ozone layer by gradually reducing the production and consumption of ozone-depleting substances (ODS). Article 4 controls trade with non-parties. The Protocol enjoins state parties to ban the import of controlled substances from any State not party to this Protocol. The Convention has been a foundation for Nigeria's priority in sensitising the public on the consequences of a depleted ozone layer (Ozone Secretariat). It is pertinent to state here that since Nigeria signed and ratified the Montreal Protocol on November 4, 2003. The government has taken several actions towards the protection of the ozone layer and the environment in general (Ozone Secretariat).

4.23 MINAMATA Convention, 2013

Nigeria has signed, ratified but has yet to domesticate the Minamata Convention. The objective of this Convention is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds (Article 1). The Convention is concerned with reducing releases of mercury and mercury compounds to land and water (Article 9). Article 10 of the Convention enjoins state parties to take measures to ensure that the interim storage of such mercury and mercury compounds is undertaken in an environmentally sound manner. Article 11 of the Convention extends the relevant definitions of the Basel Convention shall apply to wastes covered under this Convention for Parties who are also parties to the Basel

Convention. Article 14 of the Convention encourages capacity-building, technical assistance and technology transfer among state parties. Article 15 of the Convention sets up the implementation and Compliance Committee

4.24 National Policy on Solid Waste Management, 2020

This National Policy on Solid Waste Management is developed by the Federal Government of Nigeria (FGN) for a sustainable management of solid waste. The objective of the policy, among others, is to develop an integrated, safe, and economically sustainable solid waste management system in the country. The Policy reveals the large volume of solid waste produced in Nigeria with a small percentage - 20% is collected through a formal system. The Policy also waste into household waste, agricultural waste, and medical waste among other types of waste.

The Policy equally integrated waste management practices to achieve an international best practice. It finds that generating energy from solid waste is a positive from integrated waste management. Hence, renewable energy generated from waste may be utilized by small and medium-sized businesses. The Policy equally address the issues of solid waste management in Nigeria. These issues absence of adequate laws and enabling legislations; lack of political will; weak enforcement of available laws, regulations, and applicable sanctions among others.

The Policy also examines the various laws, regulations and institutions for waste management in Nigeria. The Policy also enjoins the development of the technical aspects in the solid waste management stream and proposed a review on a regular tenured basis (5years interval). **of the policy faces several challenges such as weak/inadequate institutional and legal framework to control unsound waste management practices as well as the fact that existing laws are either not enforced or obsolete**

Inadequate/insufficient infrastructure including facilities for waste collection, transportation and disposal

Poor monitoring and evaluation making it difficult to track progress and ensure environmentally safe practices

Inadequate funding/budgetary provisions hinder effective implementation of waste management initiatives.

The informal waste management sector, comprising informal/crude recyclers and scavengers, dominates the sector, thereby limiting the effectiveness of the formal waste management systems.

Lack of modern landfills, waste treatment plants, and recycling facilities.

-Poor waste collection systems, especially in rural and peri-urban areas.

Weak Legal and Regulatory Frameworks

-Outdated or inadequate laws fail to address modern waste management needs.

-Lack of harmonization between federal, state, and local regulations.

-Weak enforcement and absence of clear penalties for non-compliance.

Limited Institutional Capacity

-Waste management is fragmented across multiple agencies, leading to inefficiencies.

-Inadequate coordination between the Federal Ministry of Environment, NESREA, state environmental protection agencies, and local governments.

Financial Constraints

-Insufficient government funding and lack of private sector investment in solid waste management infrastructure.

-Low revenue collection from waste management services, leading to financial unsustainability.

Infrastructure Deficiency

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Public Awareness and Behavioral Issues

-Low levels of waste segregation and recycling culture.

-Illegal dumping and open burning remain widespread due to weak enforcement and lack of alternatives.

In case of such challenges, which recommendations below could be more suitable to the Nigerian context?

-Review and update existing waste management laws to align with international best practices.

-Introduce strict penalties for illegal dumping and improper waste disposal.

-Enhance coordination among federal, state, and local governments to ensure unified waste policies.

-Establish a centralized regulatory authority to oversee waste management nationwide.

-Encourage Public-Private Partnerships (PPPs) to invest in waste management infrastructure.

-Introduce Extended Producer Responsibility (EPR) policies to hold manufacturers accountable for post-consumer waste.

-Build engineered landfills, waste transfer stations, and recycling hubs.

-Strengthen waste collection and transportation systems, including door-to-door collection and community-based waste management schemes.

-Implement nationwide educational campaigns on waste segregation, recycling, and composting.

-Introduce incentive programs for households and businesses that adopt sustainable waste management practices.

-Encourage private sector participation in waste management through innovative recycling businesses.

inadequate penalties and lack of harmonization between the three tiers of government on solid waste management and lack of funding..

Implementation as well as enforcement of the programme ensure producers/are

Clarity in mandates: Their mandates are clear, however, overlapping roles, poor M&E, Inadequate infrastructure, inadequate funding, weak enforcement, bureaucratic inefficiencies, poor public awareness, inadequate funding, and insufficient trainings are their major challenges hindering effectiveness.

Coordination between these levels are crucial for effective environmental governance, these has been done through:

Policy development and frameworks by the federal ministry of environment for environmental protection while NESREA enforces environmental laws and regulations.

Collaboration: NESREA then works closely with State environmental protection Agencies to implement policies and regulations at the local level, addressing specific environmental issues peculiar to the states

Capacity Building

The Agencies engage in capacity building initiatives to promote effective environmental management.

Some initiatives have so far been explored to boost/improve effective collaboration like:

Stakeholder engagement to foster inclusive and sustainable outcomes, international collaborations, M&E

5. INSTITUTIONAL FRAMEWORK OF SOLID WASTE MANAGEMENT

5.1 Federal Ministry of Environment (FMEnv)

The Federal Ministry of Environment serves as the principal government body overseeing environmental policies, regulations, and initiatives at the national level. Its key functions in the context of solid waste management include;

5.1.1 Policy Formulation and Coordination

- Developing and articulating national policies and guidelines for effective waste management practices.
- Coordinating inter-agency efforts to ensure a harmonized approach across federal, state, and local levels.

5.1.2 Regulatory Oversight

- Setting national standards for waste management, including guidelines for collecting, treatment, and disposal.
- Overseeing and enforcing compliance with environmental laws, regulations, and conventions relevant to solid waste.

5.1.3 Monitoring and Evaluation

- Conducting periodic assessments and environmental audits to track waste management outcomes.
- Gathering data for ongoing evaluation of policies, programs, and practices in order to inform improvements and reforms.

5.1.4 Capacity Building and Technical Support

- Offering training and technical assistance to state and local agencies to enhance their waste management capabilities.
- Supporting research and development efforts aimed at developing innovative and sustainable waste management solutions.

5.1.5 Public Awareness and Engagement

- Leading nationwide campaigns to educate and sensitize the public on responsible waste disposal and recycling practices.
- Encouraging stakeholder participation- ranging from private sector investors to community groups - in shaping and implementing waste management programs.

Through these functions, the Federal Ministry of Environment provides overall leadership and direction for Nigeria’s solid waste management agenda, working to ensure environmental protection, public health, and sustainable development across the nation.

5.2 National Environmental Standards Regulatory and Enforcement Agency

The NESREA Act establishes the National Environmental Standards Regulatory and Enforcement Agency (NESREA, Section 7). By virtue of Section 7 of the NESREA Act, it replaced the Federal Environmental Protection Agency (FEPA). The NESREA is the main agency that enforces compliance with environmental laws, through monitoring and regulatory measures. It is empowered to make regulations on air and water quality, effluent limitations, control of harmful substances and other forms of environmental pollution and sanitation (Section 7). It is therefore the enforcement arm of the Federal Ministry of Environment. The agency is responsible for Solid Waste Management legislation, standards, and policies. NESREA is also in charge of pollution control standards and enforcement. It has been argued that NESREA places Nigeria on “equal” footing with some developed countries’ environmental protection laws (Okechukwu, 2024).

NESREA key functions include;

5.2.1 Regulatory Standards and Enforcement

- NESREA is mandated to develop and enforce regulations on various environmental issues, including solid waste management.
- It ensures that individuals, industries, and public agencies adhere to the standards set for waste disposal, recycling, and treatment.
- Domestic provisions of International agreements, protocols, conventions and the treaties on environment.

5.2.2 Monitoring and Compliance

- The Agency monitors waste management practices across different sectors to verify conformity with established regulations.
- Through inspections, audits, and investigations, NESREA identifies breaches and takes corrective actions to protect public health and the environment.

5.2.3 Legal Authority and Prosecution

- NESREA has the legal power to impose penalties and initiate legal proceedings against violators of environmental regulations.
- It also collaborates with judicial bodies to ensure that environmental offenders are held accountable for their actions.

5.3.4 Capacity Building and Awareness

- NESREA provides guidance, training, and outreach programs for stakeholders - such as local authorities, industries, and communities - on best practices in solid waste management.
- It engages in public education campaigns to foster responsible waste handling and disposal habits.
- NESREA indeed faces challenges in achieving high compliance levels for reasons like:
 - - Weak Enforcement Mechanisms: inability to effectively enforce environmental laws and regulations often due to inadequate resources, and lack of political will.
 - - Poor Public Enlightenment: Limited awareness about environmental laws and regulations among the public hinders compliance, as individuals and businesses may not understand their responsibilities.
 - - Inadequate Funding: Insufficient funding for NESREA and other environmental agencies restricts their capacity to monitor and enforce compliance effectively.
 - - Non-Legal Barriers: lack of community involvement, poor governance, and economic constraints.
- Despite these challenges, NESREA has taken steps to improve compliance, such as
 - - Enforcement Exercises: NESREA has conducted enforcement exercises, shutting down facilities that fail to comply with environmental regulations. **For instance, in March 2024, the agency closed 13 facilities in the Federal Capital Territory for various environmental crimes.**
 - - Regulatory Framework: NESREA has established 36 National Environmental Regulations covering various sectors to ensure industries and facilities comply with environmental standards.
 - - Capacity Building: NESREA engages in capacity-building initiatives to enhance the skills of personnel and promote effective environmental management.
- To further improve compliance, NESREA is constantly working and focusing on strengthening its enforcement mechanisms, increasing public awareness, and addressing the root causes of non-compliance.

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- 2. Many industries and businesses in Nigeria ignore environmental regulations due to weak penalties and lack of strict enforcement. The country's environmental laws are comprehensive, but the challenge lies in implementation and enforcement.
 - - Weak Penalties: Penalties for environmental violations are often too low to deter companies from breaking the law. For instance, the penalty for discharging hazardous substances into the environment can be as low as a fine of N1 million or an imprisonment term of 5 years.
 - - Lack of Enforcement: NESREA often struggle with inadequate funding, and lack of capacity to effectively monitor and enforce environmental laws.
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 - - Inadequate Awareness: Limited public awareness about environmental laws and regulations can also contribute to non-compliance.
 -
 - Some notable environmental regulations in Nigeria include⁴:
 - - Environmental Impact Assessment (EIA) Act: Requires businesses to conduct environmental impact assessments before starting projects that may harm the environment.
 - - National Environmental Standards and Regulations Enforcement Agency (NESREA) Act: Empowers NESREA to enforce environmental laws and regulations.
 - - Harmful Waste (Special Criminal Provisions) Act: Prohibits the unlawful carrying, depositing, and dumping of harmful waste.
 -
 - To address these challenges, Nigeria needs to strengthen its enforcement mechanisms, increase public awareness, and impose stricter penalties for environmental violations.
 -
 -
 - 3. Conflicts between federal, state, and local regulations can indeed create legal loopholes that businesses might exploit to evade compliance. These loopholes often are due to:
 - - Overlapping Jurisdictions: When federal and state laws overlap, businesses may choose to comply with the less stringent regulation, potentially evading stricter requirements.
 - - Ambiguous Language: Vague or open-ended language in laws and regulations can be interpreted in various ways, allowing businesses to exploit these ambiguities.
 - - Lack of Enforcement: Inconsistent or inadequate enforcement of regulations can embolden businesses to exploit loopholes.
 -
 - Some notable examples of conflicts between federal and state regulations include⁴:
 - - Marijuana Laws: While several states have legalized marijuana, it remains a Schedule I substance under federal law, creating a direct conflict.
 - - Environmental Regulations: States may implement stricter environmental policies than federal standards, leading to potential conflicts and loopholes.
 - - Immigration Laws: States may enact their own immigration policies, which can contradict federal enforcement practices.
 -
 - To address these challenges, regulatory bodies can:
 - - Refine Laws and Regulations: Continuously review and revise laws to close loopholes and prevent exploitation.
 - - Enhance Enforcement: Ensure consistent and effective enforcement of regulations to deter businesses from exploiting loopholes.
 - - Increase Transparency: Promote transparency and public awareness about laws and regulations to prevent unintentional non-compliance.
 -
 - By understanding these dynamics, businesses and regulatory bodies can work together to create a more cohesive and effective regulatory framework.
 -
 - 4. Limited financial resources basically is NESREA's significant challenge in conducting nationwide monitoring and enforcement. Inadequate funding restricts the agency's ability to effectively monitor environmental compliance, enforce regulations, and respond to emerging environmental issues appropriately. This has in no small measures hampered NESREA's capacity to:
 -

- - Monitor and enforce compliance with environmental regulations and standards
- - Provide adequate public awareness and education on environmental issues
- - Implement effective environmental policies and regulations
-
- To address these challenges, NESREA has explored alternative solutions, such as:
 - - International collaborations: Partnering with global organizations to access funding, technical assistance, and capacity-building initiatives
 - - Capacity-building initiatives: Enhancing the skills and knowledge of personnel to improve environmental management and enforcement
 - - Public-private partnerships: Collaborating with private sector entities to leverage resources and expertise
-
- Despite these efforts, NESREA's financial constraints continue to impact its effectiveness in protecting Nigeria's environment. Increased funding and resource allocation are crucial to enabling the agency to fulfill its mandate and ensure sustainable environmental management in Nigeria.
-
- 5. NESREA is indeed open to public participation and recognizes its importance in environmental governance. The agency has implemented various initiatives to engage the public and promote environmental awareness^{1 2}:
 - - Public Awareness Campaigns: NESREA undertakes aggressive public awareness campaigns and advocacy to communicate the concept of voluntary compliance and enlist support from key stakeholders, including trade unions, professional associations, civil society organizations, and faith-based organizations.
 - - Environmental Education: The agency creates environmental education curricula for integration into formal and informal education systems, promoting awareness and understanding of environmental issues.
 - - Public Participation in EIA Process: NESREA involves the public in the Environmental Impact Assessment (EIA) process, allowing affected communities to contribute to decisions that impact their environment and livelihoods.
 - - Reporting Environmental Violations: The agency provides a platform for citizens to report environmental violations, ensuring collective responsibility for preserving the environment.
 - - Stakeholder Engagement: NESREA engages with various stakeholders, including state governments, traditional institutions, and civil society organizations, to build partnerships and promote environmental awareness.
-
- By engaging with the public, NESREA aims to³:
 - - Promote Environmental Awareness: Educate citizens about environmental issues and the importance of sustainable practices.
 - - Foster Collective Responsibility: Encourage citizens to take ownership of environmental protection and conservation.
 - - Improve Decision-Making: Incorporate diverse perspectives and concerns into environmental decision-making processes.
- Overall, NESREA's commitment to public participation reflects its dedication to transparency, accountability, and inclusive environmental governance.

5.3.5 Policy Support and Coordination

- While policy - making is generally under the purview of the Federal Ministry of Environment, NESREA supplies the technical and enforcement perspectives crucial for effective legislation.

- The agency also coordinates with other institutions - both at the federal and state levels - to ensure that environmental standards and regulations are consistently applied and updated.
- *NESREA collaborates with local governments through various initiatives to promote environmental awareness, enforcement, and sustainability. Here's how they work together^{1 2}:*
- *- Partnerships: NESREA builds partnerships with state governments to create a win-win situation for both parties, promoting environmental awareness, job creation, and a cleaner environment.*
- *- Zonal Headquarters: NESREA has zonal headquarters in six geopolitical zones, allowing for more effective implementation of its mandate at the state level.*
- *- State Offices: NESREA has a presence in 35 states, facilitating collaboration with state governments and local authorities.*
- *- Joint Initiatives: NESREA works with local governments on specific projects, such as emission control programs. For example, NESREA partnered with the Ondo State Internal Revenue Service to implement the National Emission Control Programme.*
- *- Capacity Building: NESREA engages in capacity-building initiatives to enhance the skills of personnel and promote effective environmental management at the local level.*
- *- Community Engagement: NESREA involves local communities in environmental decision-making processes, ensuring that their concerns and needs are addressed.*
- *These collaborations enable NESREA to effectively implement its mandate and promote environmental sustainability across Nigeria. By working together, NESREA and local governments can address specific environmental challenges and develop tailored solutions to meet the unique needs of each region.*

NESREA plays a pivotal role in maintaining environmental quality in Nigeria by transforming policy directives into tangible, enforceable actions with the domain of solid waste management.

5.3 Abuja Environmental Protection Board (AEPB)

The AEPB is responsible for solid waste management in the Federal Capital Territory (FCT). The AEPB was established under AEPB Act, 1997 and serves as the regulatory authority charged with the responsibility for the protection and management of the environment within the Federal Capital Territory (Nigerian Economy Summit Group, 2020). The AEPB function is directly providing Solid Waste Management services in sweeping, collection, and final disposal, as well as collection of health care waste and waste from Communal Collection Centre. The power of the AEPB, according to the Act, includes the power to issue regulations, guidelines, and directives related to environmental protection and management. However, according to a study, it has been discovered that inadequate funding of AEPB affects its efficiency. This is evident in the poor morale of personnel, immobilised vehicles *inter alia* (Jamiu, 2019). In a recent study also, Kadafa (2020) finds that only 42% of Abuja residents have collection services available to them provided by the municipality. Also, open dumping within neighbourhoods is a common practice in Abuja Kadafa (2020).

Also, the recent High Court of the Federal Capital Territory, Abuja further serves as a clog in the exercise of the power of the Board. In *NICO Plc v AEPB CV/3493/2022*, the Court held that the Board cannot impose or collect any levy as this is within the authority and power of the Abuja Municipal Area Council (AMAC). This

The Abuja Environmental Protection Board (AEPB) faces several difficulties, including

- **Insufficient Financial Resources:** AEPB has been struggling with recovering debts from government ministries and agencies, with a total of N10 billion owed for waste collection services. This financial constraint limits its ability to provide efficient waste collection and environmental services.
- **Weak Enforcement of Environmental Laws:** AEPB lacks the power to collect refuse and sewage levies from residents and businesses, as a court ruling has established that

Abuja Municipal Area Council (AMAC) is the only body constitutionally empowered to impose such levies.

- Limited Authority: AEPB's authority is restricted due to the court ruling, which declared that the AEPB Act conflicts with the Constitution, and AMAC has the constitutional responsibility for waste management within its jurisdiction.
- Manpower Constraints: While there's no direct evidence of AEPB's manpower limitations, the agency's effectiveness is hindered by its restricted authority and financial constraints.
- Population Growth: Abuja's expanding population increases waste generation, stretching AEPB's capacity to manage solid waste effectively.
- Limited Community Engagement: There's limited information on AEPB's community engagement initiatives, but effective collaboration with local communities is crucial for promoting environmental sustainability.
- Private Sector Partnerships: AEPB's partnerships with private waste management companies are not well-documented, but such collaborations could enhance efficiency in waste management.

To address these challenges, AEPB may need to⁴:

- Strengthen partnerships with AMAC and other stakeholders to enhance its authority and effectiveness
- Improve financial management and explore alternative revenue streams
- Enhance community engagement and education on proper waste disposal methods and environmental regulations
- Explore innovative solutions for waste management, such as recycling and waste reduction initiatives.

5.4 Nigerian Maritime Administration and Safety Agency (NIMASA)

The agency is established under Section 3 of the NIMASA Act. The objective of the Agency is to, among other things, regulate and promote maritime safety, security, marine pollution, and maritime labour (Section 1). The agency is responsible for the administration of the NIMASA Act, the Merchant Shipping Act and its amendments and all other Federal Legislation on Maritime Labour, Safety and Security (Section 2)

5.5 National Oil Spill Detection and Response Agency (NOSDRA)

The agency's functions are stipulated in sections 6 and 7 of the Act. The function includes but not limited to the surveillance and ensure compliance with all existing environmental legislation in the petroleum sector including those relating to prevention, detection and general management of oil spills, oily wastes, and gas flare. The Agency may, with the approval of the Governing Board make regulations which are in its opinion necessary for giving full effect to the provisions of this Act (Section 26).

6. OVERVIEW OF LEGAL MAPPING IN NIGERIA

6.1 Brief Overview of the Legal and Institutional Framework Governing Waste Management in FCT Nigeria.

Nigeria's legal framework for waste management is comprehensive, comprising various laws, regulations, and guidelines aimed at upholding public health standards, preserving environmental integrity, and fostering sustainable development. The Constitution of the Federal Republic of Nigeria serves as the foundational document, emphasizing environmental conservation in Section 20. While lacking enforceable mechanisms, environmental issues can be pursued through fundamental human rights actions, highlighting the foundational importance of environmental stewardship. Legislative instruments such as the Environmental Impact Assessment Act of 1992 and the National Environmental Standards Regulatory and Enforcement Agency Act of 2007 play pivotal roles in waste management, mandating proactive planning and mitigation measures. Additionally, sector-specific regulations like the Harmful Wastes Act No. 42 of 1998 demonstrate Nigeria's commitment to combating hazardous waste disposal, albeit with room for improvement in fines and penalties. Nigeria's adherence to international conventions further underscores its commitment to global environmental stewardship.

Nigeria has several laws that regulate solid waste. However, the legislations, most of which were established decades ago, may not be effective in managing the evolving waste challenges of the country (Ayotamuno and Gobo, 2004). As a matter of fact, these laws are anachronistic and mundane in addressing the current environmental issues that beset the country. Additionally, the laws do not have any technological initiatives in their provisions. The Regulations made pursuant to the extant primary laws are equally old, yet these laws have not been reviewed. It is therefore difficult to get an optimized effectiveness from an anachronistic law.

While solid waste was easy to manage back then, technological advancements have led to the emergence of e-waste, which the existing legislation may not be able to effectively handle (Orie, 2014). Nigeria faces numerous challenges in the management of e-waste, including the lack of a comprehensive national policy, national measures for suitable waste management, and legislation that specifically

addresses e-waste management. Rather than being a comprehensive encompassing all levels of government and the private sector, waste management is typically viewed as the purview of either the state or federal governments (Orie, 2014). There is therefore the need to review these laws to reflect the current economic realities technological advancement.

NESREA has so far

1. Developed a National E-Waste Management Regulation and has been reviewed that comprehensively outlines guidelines for e-waste collection, recycling, and disposal, aligning with international standards like the Basel Convention.
2. Stakeholder Engagement: been engaging with other government regulatory agencies, private sector, civil society, and communities in policy development to ensure inclusivity and effectiveness.
3. implementation of the EPR programme in the sector through the Guidance Document for the EEE sector in Nigeria to Regulate the lifecycle of electronic products, mandating safe disposal methods and encouraging take-back programs.
4. Strengthen Regulatory Frameworks: Enhance NESREA's powers to monitor and enforce e-waste disposal laws, deploying specialized task forces to combat illegal dumping.
5. Public Awareness and Education: Launch nationwide campaigns to educate citizens on e-waste dangers and promote recycling initiatives.
6. International Cooperation: Partner with organizations like UNEP, GEF and the Basel Convention Secretariat for technical and financial support.
7. Study Best Practices: Adopt successful e-waste management models from countries like Rwanda and Ghana.
8. Implement Extended Producer Responsibility (EPR): Hold manufacturers accountable for e-waste disposal and recycling.
9. Establish E-Waste Recycling Infrastructure: Develop facilities and programs for safe e-waste recycling and disposal.

This steps would help Nigeria develop a comprehensive e-waste management framework, reducing environmental and health risks associated with improper disposal.

6.2 Institutional Framework

Nigeria institutional framework for environmental management comprises various governmental bodies and agencies tasked with oversight and regulation. The Federal Ministry of Environment (FMEnv) serves as the primary governmental body responsible for administering and enforcing environmental laws nationwide, facing challenges such as limited funding and staffing shortages. The National Environmental Standards Regulatory and Enforcement Agency (NESREA) plays a crucial role in ensuring compliance with environmental laws and standards but faces criticisms regarding its reactive approach and funding limitations. The Abuja Environmental Protection Board (AEPB) oversees solid waste management in the Abuja metropolis but lack of due to funding constraint affects their outputs. Other key agencies include the Environmental Health Officers Registration Council (EHORCON), Nigerian Maritime Administration and Safety Agency (NIMASA), and National Oil Spill Detection and Response Agency (NOSDRA), each contributing to environmental protection in their respective domains.

Lack of database on environmental quality has jeopardized the ability of NESREA to monitor their progress in dealing with waste management challenges in Nigeria (Eberinwa, 2023). A perennial problem in Nigeria's institutional set up is its heavy reliance on the analog methods of documentation. Nigeria does not possess an environmental sustainability database, hence rendering it unfeasible for environmental organisations to monitor advancements in waste management. Despite embracing environmental principles, authorities are unable to modify them in response to new knowledge. This hinders the effective execution of agency functions and legislation (Eberinwa, 2023).

To address the lack of database on environmental quality and enhance NESREA's ability to monitor progress in dealing with waste management challenges, the following solutions could be considered in the Nigerian context:

- Digital Environmental Data Management
 - Develop a National Environmental Data Management System (NEDMS): Create a centralized system to collect, store, and analyze environmental data, enabling informed decision-making and effective policy implementation.
 - Online Reporting Platform: Establish an online platform for industries, municipalities, and regulators to report data in real-time, enhancing transparency and facilitating prompt action.
 - Digital Waste Management Reports: Mandate digital reporting for industries and municipalities to streamline data collection and reduce paper-based records.
- Technology-Driven Waste Management
 - Data Analytics and AI: Invest in data analytics and AI tools to detect illegal waste dumping, identify trends, and optimize waste management strategies.
 - Smart Waste Monitoring Systems: Collaborate with universities, research institutions, and tech firms to develop smart waste monitoring systems that track waste generation, collection, and disposal.
 - Waste-Tracking Mobile Apps: Encourage tech startups to create mobile apps for citizens to report waste-related issues, promoting community engagement and participatory governance.
- Additional Recommendations
 - Leverage Remote Sensing and GIS: Utilize digital tools like remote sensing and Geographic Information Systems (GIS) to monitor environmental changes and track conservation initiatives.
 - Capacity Building: Invest in training and capacity building for regulatory agencies to enhance their ability to uphold environmental regulations.
 - Public Awareness and Education: Launch nationwide campaigns to educate citizens on environmental issues and promote sustainable practices.¹

By implementing these solutions, Nigeria can develop a robust environmental data management system, enhance waste management practices, and promote sustainable development.

More so, shortage of staff or manpower and poor funding impose difficulties on NESREA and other environmental agencies in enforcing environmental standards and regulations (Eberinwa, 2023). Management and control remain an issue in the enforcement of environmental law (Noiki et al, 2021). The waste management authorities blame the attitude and educational level the people (Kadafa, 2017). Conversely, the people indict the authorities for infrequent collection, and some areas entirely do not receive waste management services (Kadafa, 2017).

Solid waste management requires collaboration among various stakeholders, including government agencies, private sector companies, non-profit organizations, and local communities. Government agencies establish a regulatory framework, develop sustainable waste management policies, and enforce compliance. Non-profit organizations raise awareness and advocate for sustainable practices, while local communities play a central role in waste management. Engaging with communities ensures culturally relevant solutions and promotes individual responsibility. Fostering

dialogue among stakeholders allows for knowledge sharing, coordination, and innovation, leading to an integrated waste management system. This collaboration contributes to environmental sustainability, public health improvements, and socio-economic development.

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- Additional Recommendations

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- Public Awareness and Education: Launch nationwide campaigns to educate citizens on environmental issues and promote sustainable practices.¹

By implementing these solutions, Nigeria can develop a robust environmental data management system, enhance waste management practices, and promote sustainable development

Specific and practical initiatives to improve solid waste management in the Nigerian context:

- Community-Based Initiatives

- Community Recycling Programs: Implement local recycling initiatives with accessible recycling bins and regular collection schedules, accompanied by educational campaigns to raise awareness on recyclable materials.

- Composting Initiatives: Establish community composting programs, providing compost bins for households or setting up centralized composting sites to manage organic waste.

- Waste Audits for Communities: Conduct waste audits to analyze waste composition, identify opportunities for reduction and recycling, and share findings with the community to raise awareness and motivate action.

- Education and Awareness

- Waste Reduction Workshops: Organize workshops to teach citizens how to reduce waste through upcycling, DIY household products, and zero-waste lifestyles.

- Environmental Education: Integrate environmental education into school curricula to promote awareness and responsible waste management practices among children and youth.

- Specialized Waste Management
 - E-Waste Collection Drives: Host collection events for electronic waste to ensure safe disposal and recycling of hazardous materials found in electronics.
 - Collaboration with Local Farmers: Partner with local farms to divert organic waste for use as animal feed or compost, reducing landfill rates and promoting sustainable agriculture.
- Implementation Strategies
 - Community Engagement: Engage with local communities, involving them in the planning and implementation of waste management initiatives to ensure ownership and sustainability.
 - Partnerships and Collaborations: Foster partnerships with local government, private sector, and civil society organizations to leverage resources, expertise, and funding for waste management initiatives.
 - Monitoring and Evaluation: Establish a monitoring and evaluation framework to track progress, identify challenges, and make adjustments to waste management initiatives.

By implementing these initiatives, Nigeria can improve solid waste management, reduce environmental pollution, and promote sustainable development.

7. IDENTIFICATION OF GAPS IN WASTE MANAGEMENT IN NIGERIA USING UN-HABITAT WaCT FINDINGS OF ABUJA, NIGERIA

7.1 Abuja, Nigeria

Abuja is a city located in the centre of Nigeria, within the Federal Capital Territory (FCT), mainly built in the 1980s. It officially became Nigeria's capital on 12 December 1991, replacing Lagos, though the latter remains the country's most populous city. At the 2006 census, the city of Abuja had a population of 776,298, making it one of the ten most populous cities in Nigeria. Abuja's current metro area population in 2024 is approximately 4,026,000, a 4.84% increase from 2023 (United Nations population projections).

The city is divided into satellite towns around the Federal Capital Territories namely Bwari, Gwagwalada, Kuje, and Kwali Area Councils. Abuja Environmental Protection Board is (AEPB) is the regulatory body responsible for the enforcement of all environmental legislations and abatement of all forms of environmental degradation and nuisance. It regulates the impact of physical development on the ecosystem.

WaCT survey was conducted at the beginning of May 2024 in 6 districts, as follows: Maitama and Asokoro districts as high-income areas; Wuse 1& 2 as middle-income areas, and, Garki 1 and Durumi districts as low-income areas.

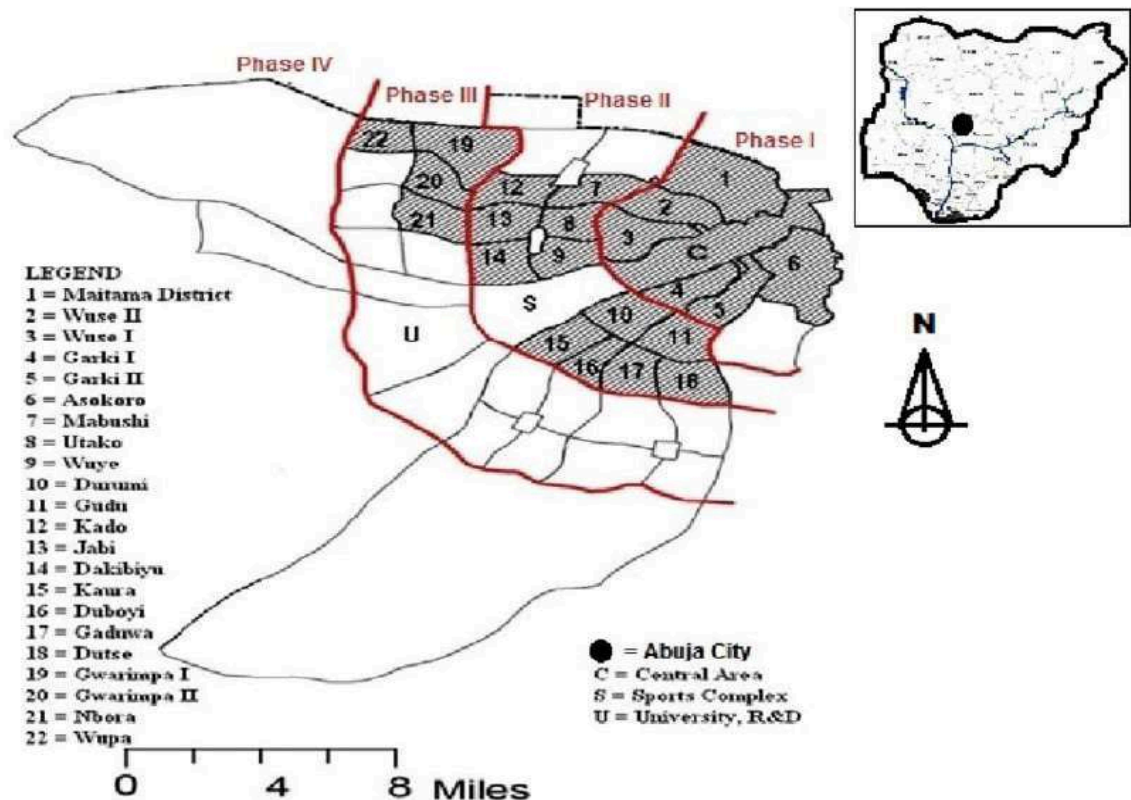


Figure 1: Map of FCT Abuja (source: Explore Abuja)

7.2 WaCT and WFD Survey Results

According to the WaCT application, approximately 1,487 tonnes per day of municipal solid waste is generated in the urban areas of Abuja, out of which 57% is collected and 57% is managed in controlled facilities. Approximately 646 tonnes (53%) per day

of municipal solid waste remains uncollected. The per capita MSW generation of the study area is 0.73 kg/capita/day. The average household MSW generation is 0.51 kg/capita/day, and the food waste generation is 0.29 kg/capita/day.



Figure 2: Household waste generation and composition analysis in Abuja, Nigeria

Table 1: Key WaCT and WFD Data in Abuja Nigeria

Income group	High income	Middle income	Low income
Waste generation rate (kg/capita/day)	0.65	0.53	0.48
Total population	204,000	612,000	1,224,000
Total MSW generated from household(t/day)	132	325	583
Total MSW generated from non-household sources (t/day)	446		
Total MSW generated (t/day)	1487		
City Plastic Leakage into water bodies (kg/person/year)	10.3		

As per the survey findings, 17 tonnes of MSW are recovered daily, constituting approximately 1% of the total MSW generated.

WaCT Flow Chart

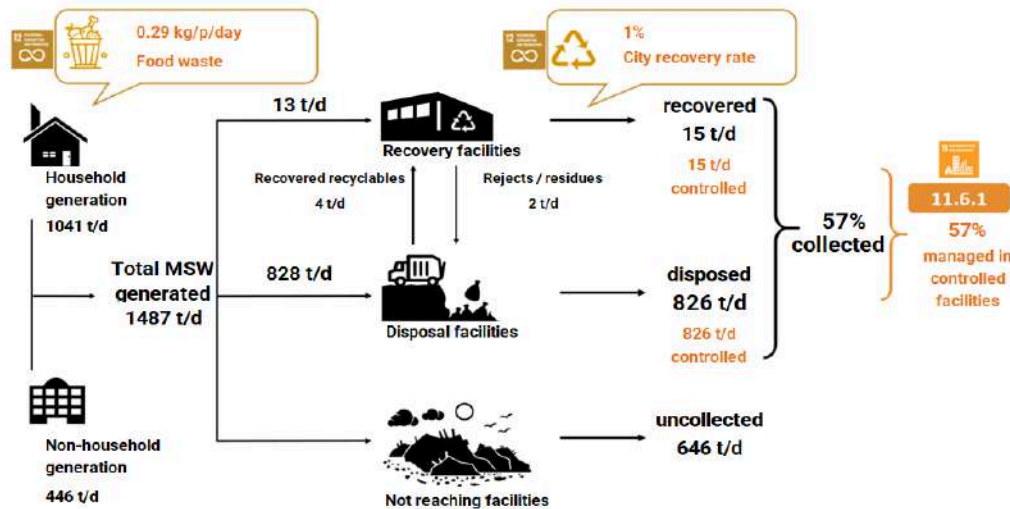


Figure 3: WaCT flow chart results in Abuja, Nigeria

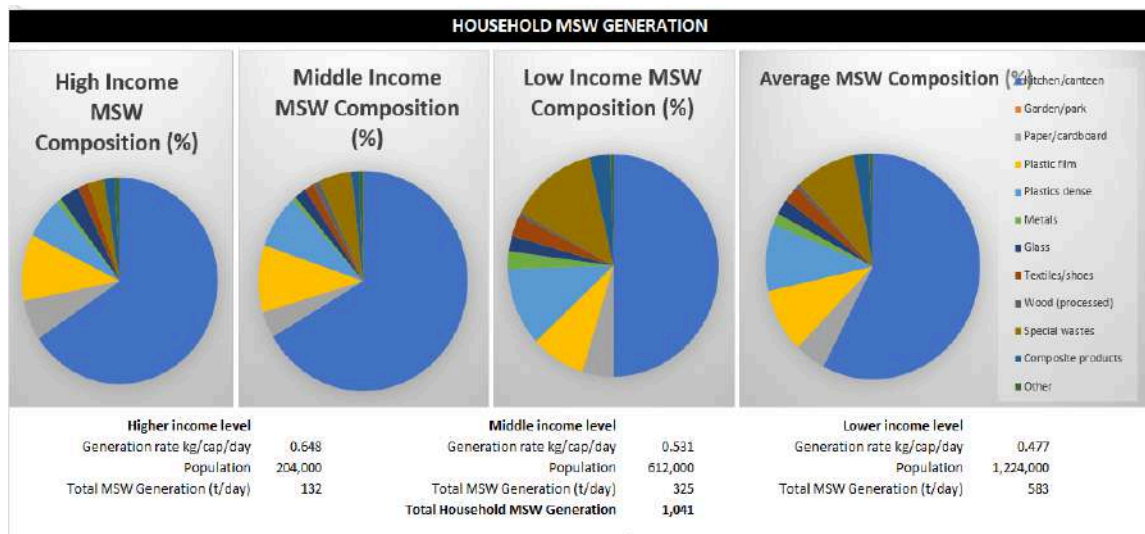


Figure 4: Household MSW Composition in Abuja

The diagram below shows the flow of plastic waste in the survey area with potential leakages. Out of the total of 89,293 tonnes/year of plastic waste generated, equivalent to 245 tonnes daily, 54% of the plastic waste is unmanaged and leaking into the environment, which is an estimated 48,036 tonnes per year. Out of the total unmanaged plastic, 21,098 tonnes per year are leaking into water bodies (the

equivalent of 10.3 kg/person/year), 21,531 tonnes per year are retained on land, 4,761 tonnes per year are being openly burnt, and 646 tonnes per year are trapped in drains.

The largest source of plastic leakage into the environment is due to the uncollected waste that remains in the environment or is being openly burnt by residents as a means of disposing of their waste. The second largest source is represented by the disposal facilities where operation standards meet low levels of control.

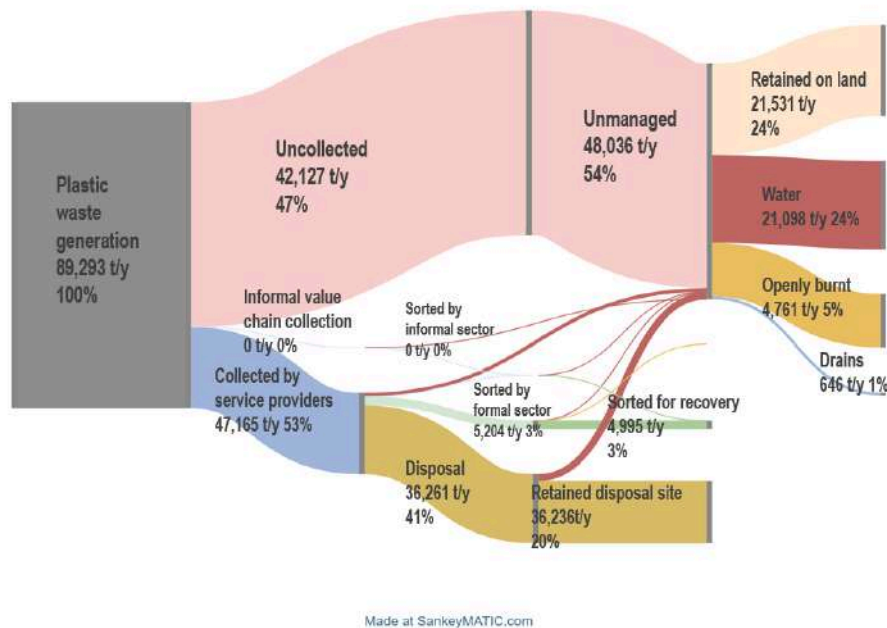


Figure 5: WFD results for Abuja, Nigeria for Plastic Waste Stream in tonnes per year and % of the total generated plastic waste.

7.3 Policy and Infrastructure Gaps Analysis

7.3.1 Status quo

Solid Waste Management (SWM) in Nigeria is governed by a comprehensive legal framework involving multiple regulations and institutions at federal, state, and local levels.

7.3.1.1 Key Legal Frameworks Governing SWM

- Environmental Management and Protection Law 2017: Establishes general environmental protection and sustainable waste management guidelines across Nigeria.
- Abuja Environmental Protection Board (AEPB) Act, 1997: This law established the Abuja Environmental Protection Board (AEPB), outlining its mandate to protect the environment and manage waste in the Federal Capital Territory (FCT), including Abuja. The AEPB is a key institution in overseeing environmental protection and SWM activities within the FCT.
- Waste Management Regulations 2012: These regulations set forth gazetted fees for waste management services payable by residents of the FCT, ensuring the sustainability of SWM services.
- Guideline and Requirements for Waste Recycling in the FCT (draft): A draft document that provides guidelines for promoting recycling initiatives in the FCT, aligning with sustainable practices for effective waste resource recovery. However, it is unclear when this guideline will be finalized or if consultations with stakeholders have been conducted.
- Solid Waste Management Policy Guideline for FCT (draft): This draft outlines a comprehensive framework for SWM in the FCT, including waste collection, transport, disposal, and community engagement. Similar to the recycling guideline, it remains unclear when this policy will be adopted or if stakeholder consultations have taken place.

These uncertainties regarding the adoption and consultation process for key draft policies highlight critical gaps in the legal and institutional framework for effective SWM in the FCT.

The AEPB has developed strategic plans to address solid waste management challenges in the FCT. These include the Strategic Solid Waste Management Plans for 2011-2015 and 2017-2021, which focus on enhancing waste collection, transportation, treatment, and disposal, in compliance with environmental standards. AEPB is also in the process of proposing a Solid Waste Management Roadmap for the FCT.

At the National Level, SWM and ecological regulations fall under the jurisdiction of several institutions.

7.3.1. Key Institutions in SWM

Federal Ministry of Environment (FMoE):

- Develop environmental laws, policies, and regulations.
- Conducts environmental assessments, especially for transboundary projects.
- Coordinates with state environmental agencies to implement environmental laws.
- Oversees ecological controls, SWM infrastructure development, and donor coordination.

The Federal Ministry of Environment (FMoE) plays a crucial role in waste management in Nigeria, focusing on^{1 2 3}:

- Policy Formulation: Developing and implementing policies, guidelines, and regulations for effective waste management, such as the National Policy on Solid Waste Management and the Plastic Waste Control Regulations.
- Coordination and Oversight: Supervising and coordinating the activities of parastatals and agencies responsible for waste management, including the National Environmental Standards and Regulations Enforcement Agency (NESREA) and the National Oil Spill Detection and Response Agency (NOSDRA).
- Environmental Impact Assessment: Conducting environmental impact assessments and compliance monitoring for projects and activities that may affect the environment.
- Waste Reduction and Recycling: Promoting waste reduction, recycling, and sustainable waste management practices through initiatives like the Circular Economy Roadmap and the Reverse Vending Machine.

- Public Awareness and Education: Raising public awareness and promoting understanding of waste management issues and best practices.
- Collaboration and Partnerships: Cooperating with relevant ministries, departments, and agencies, as well as international organizations, private sector entities, and non-governmental organizations to address waste management challenges.
- Research and Development: Supporting research and development in waste management and environmental conservation.

Some specific initiatives and programs implemented by the FMoE include:

- Ogoniland Cleanup: A comprehensive cleanup and remediation program for the Ogoniland region, which has been impacted by oil spills and environmental pollution.
- Great Green Wall Programme: An initiative aimed at combating desertification and promoting sustainable land management practices in the Sahel region.
- Clean and Green Initiatives: Programs focused on promoting environmental cleanliness and sustainability in Nigerian cities and communities.
- Sustainable Procurement, Environmental and Social Standards Enhancement (SPESSE) Project: A capacity-building initiative aimed at developing sustainable procurement and environmental management practices in Nigeria's public and private sectors.

National Environmental Standards and Regulations Enforcement Agency (NESREA):

- Enforces SWM legislation, standards, and policies.
- Oversees pollution control measures and ensures adherence to environmental standards.

NESREA

- Regulatory Framework: NESREA is responsible for enforcing regulations and standards for solid waste management, including the Management of Solid and Hazardous Waste Regulations.
- Policy Implementation: The agency implements policies aimed at promoting sustainable waste management practices, such as the National Policy on Solid Waste Management and the Circular Economy Roadmap.
- Monitoring and Enforcement: NESREA monitors compliance with environmental laws and regulations, conducting inspections and imposing penalties for non-compliance.
- Public Awareness and Education: The agency engages in public awareness campaigns to educate citizens on proper waste disposal practices and promote environmental stewardship.
- Partnerships and Collaborations: NESREA partners with international organizations, government agencies, and private sector entities to leverage resources and expertise for effective waste management.
- Waste Reduction and Recycling: The agency promotes waste reduction, recycling, and sustainable waste management practices through initiatives like Extended Producer Responsibility (EPR) programs.
- Research and Development: NESREA supports research and development in waste management, exploring innovative solutions to address Nigeria's waste challenges.

Some specific regulations enforced by NESREA include:

- National Environmental (Sanitation and Wastes Control) Regulations: Guidelines for waste control and environmental sanitation.
- National Environmental (Solid Waste Management) Regulations: Standards for solid waste management, including waste segregation, collection, transportation, treatment, and disposal.

- Extended Producer Responsibility (EPR) Regulations: Requirements for manufacturers, producers, and importers to take responsibility for waste generated from their products.

Federal Ministry of Health

- Oversees healthcare-related waste management and ensures compliance with health and safety standards for healthcare waste.

The Federal Ministry of Health in Nigeria plays a significant role in solid waste management, particularly in healthcare waste management. Some of its explicit roles and responsibilities include^{1 2}:

- Policy Formulation: Developing and implementing policies, guidelines, and regulations for healthcare waste management, in collaboration with other relevant agencies and stakeholders.
- Guideline Development: Creating national guidelines for healthcare waste management, such as the National Guidelines for Water, Sanitation, and Hygiene (WASH) in Healthcare Facilities in Nigeria.
- Collaboration and Partnerships: Working with international organizations, other government agencies, and stakeholders to develop and implement effective healthcare waste management strategies.
- Regulatory Framework: Supporting the development of regulatory frameworks for healthcare waste management, including the National Environmental (Healthcare Waste Control) Regulations.
- Public Health Protection: Ensuring that healthcare waste management practices prioritize public health protection and environmental safety.

Some specific initiatives and programs implemented by the Federal Ministry of Health include:

- National Healthcare Waste Management Plan: Developing a national plan to manage healthcare waste effectively.
- Healthcare Waste Management Policy: Creating a policy framework for healthcare waste management in Nigeria, in collaboration with the Federal Ministry of Environment.
- Training and Capacity Building: Providing training and capacity-building programs for healthcare workers and waste management personnel.

The Ministry works closely with other agencies, such as the Federal Ministry of Environment and the National Environmental Standards and Regulations Enforcement Agency (NESREA), to ensure effective healthcare waste management in Nigeria.

Private Sector Involvement

In Abuja, various aspects of SWM are contracted to private companies, such as street sweeping, waste collection, final disposal, and recycling. These partnerships also extend to services like Litter and Vegetation Control. The integration of the private sector into SWM has contributed to improved efficiency and expanded service coverage. However, successful public-private partnerships require effective contract management and monitoring to maintain service standards.

Private sector involvement in solid waste management in Nigeria has shown promising results, particularly in major cities like Lagos and Abuja. Here are some key points to consider:

Benefits of Private Sector Involvement

- Improved Efficiency: Private sector participation has led to more efficient waste collection services, especially in high-income areas.
- Increased Coverage: Private operators have expanded waste collection services to more areas, including those previously unserved or underserved.
- Better Equipment: Private companies have invested in modern waste management equipment, such as compacting trucks and street sweepers.^{1 2}

Examples of Successful Private Sector Involvement

- Lagos State: The Lagos Waste Management Authority (LAWMA) has partnered with private sector operators to improve waste collection and disposal services. Over 340 private sector participants are registered in Lagos State, and they have introduced door-to-door waste collection services.
- Abuja: The Abuja Environmental Protection Board (AEPB) has entered into a joint-venture agreement with a Ukrainian firm for waste management activities in the city.
- Kano: Private sector participation in solid waste management has been assessed, with 50 companies operating under franchise agreements.³

Challenges and Limitations

- Financial Constraints: Private sector operators often face financial challenges, including inadequate funding and difficulty in recovering costs from waste generators.
- Regulatory Framework: The lack of a comprehensive legislative framework and effective enforcement mechanisms can hinder private sector involvement in solid waste management.
- Public Awareness: Limited public awareness and education on proper waste disposal practices can affect the success of private sector involvement in solid waste management.⁴

Way Forward

- Strengthening Partnerships: The government should strengthen partnerships with private sector operators to leverage their expertise and resources.
- Improving Regulatory Framework: A comprehensive legislative framework and effective enforcement mechanisms are necessary to support private sector involvement in solid waste management.
- Public Education: Public awareness and education campaigns can help promote proper waste disposal practices and support the success of private sector involvement in solid waste management.
 - At the Municipal Level, the Department of Public Health is tasked with overseeing Municipal Solid Waste (MSW) management to ensure public health standards are maintained.

7.4 Role of AEPB in Abuja's Waste Management

The AEPB operates under the Abuja Metropolitan Management Council (AMMC), managing MSW collection, transportation, and disposal. The AEPB's strategic approach aligns with the broader national SWM policies issued by the Federal

Ministry of Environment and NESREA. Local Implementation involves the Abuja Environmental Protection Agency, which is responsible for operational activities such as street sweeping, waste collection, healthcare waste management, and handling waste from Communal Collection Centres. The SWM department within AEPB employs 106 staff members, including 4 administrative staff and 102 operational staff, which helps deliver these essential services.

7.4.1 Organizational Structure of AEPB

The Abuja Environmental Protection Board is structured to efficiently manage its waste management responsibilities:

- Director of SWM: Heads the department, providing overall leadership and strategic direction.
- Deputy Directors: Lead specific divisions or units, overseeing focused areas of waste management.
- Assistant Directors: Support coordination of units and supervise operations to align with department objectives.
- Supervisors: Manage daily operations, ensuring activities are executed as planned.

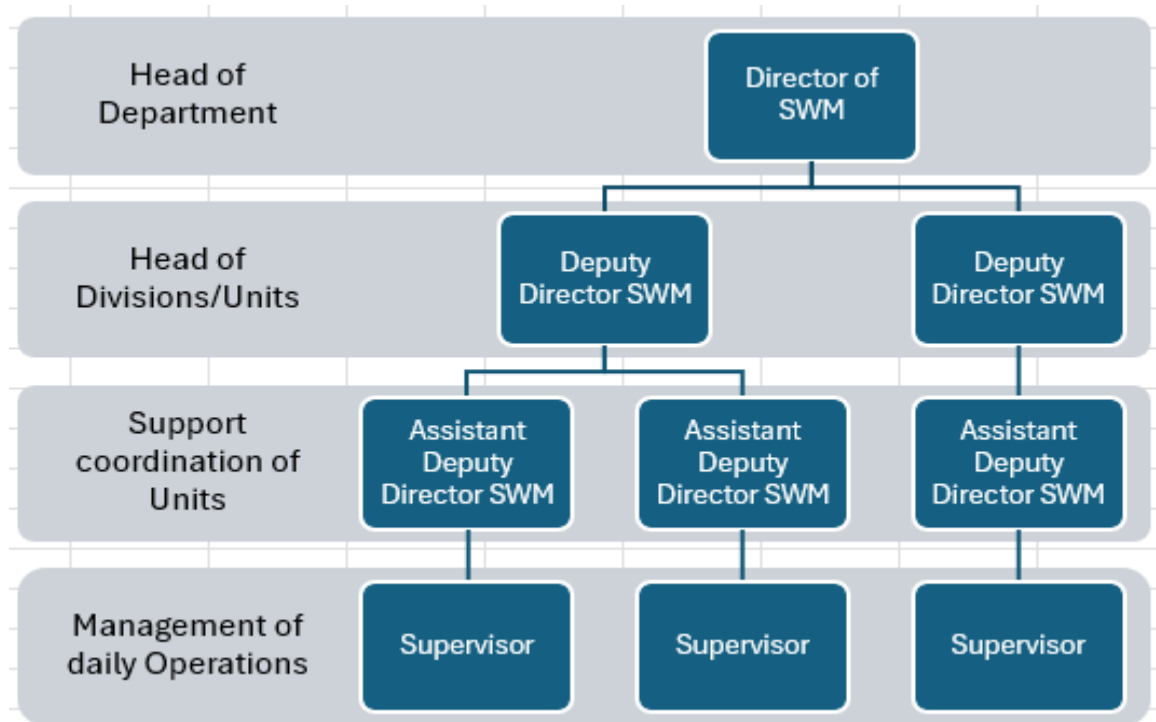


Figure 6: The structure of the Abuja Environmental Protection Board

7.5 Gaps and Challenges

In Nigeria, particularly in Abuja, SWM operates under a multi-layered regulatory framework with various institutions responsible for ensuring sustainable waste management. Progress has been made in planning, regulatory enforcement, and public-private partnerships. However, there are significant gaps and challenges in Nigeria's SWM sector, particularly in Abuja:

The roles of different stakeholders are very clear.

- **Fragmented Policy Implementation:** The overlapping responsibilities among multiple institutions often result in fragmented implementation, reducing the effectiveness of SWM programs.
- **Limited SWM Infrastructure:** Although strategic plans are in place, there is insufficient SWM infrastructure, such as recycling and sanitary landfills. This shortage hinders the effectiveness of waste management efforts, particularly outside major cities like Abuja.
- **Draft Policies and Unfinalized Guidelines:** Several critical policies, such as the Guideline and Requirements for Waste Recycling and the Solid Waste Management Policy Guideline for FCT, are still in draft form. Finalizing and enforcing these guidelines is crucial for standardized and effective recycling and SWM operations.
- **Human Resource Constraints:** The limited number of personnel in the AEPB SWM department poses a challenge, as it restricts the ability to expand services, conduct proper monitoring, and handle the growing waste management needs of the city.
- **Dependence on the Private Sector:** While private sector involvement has improved SWM services, it has also introduced challenges related to accountability and regulation. The effectiveness of privatized services relies heavily on robust oversight and adherence to performance standards.

To achieve efficient SWM, efforts must focus on improving institutional coordination, finalizing policies, investing in infrastructure, and enhancing human resource capabilities.

7.5.1 Waste collection and transfer

AEPB manages the residential and public waste within the Central Business District (CBD) while the other residential areas are managed by the SMEs which provide solid waste collection services. The SMEs operate within the metropolitan areas of the city. Waste collection services are currently provided to approximately 65% of the city's population, with households receiving waste collection services twice a week. This estimate is based on the area map due to the absence of precise population data for service coverage. Road sweeping services are also provided in key locations, including the city centre, public areas, and residential neighbourhoods, to maintain overall cleanliness and hygiene.

Waste collection services are charged from ₦ 1,000 (USD 0.7) for low-income areas to as much as ₦2,500 (USD 1.7) for middle-income areas and ₦3,750 (USD 2.5) for high-income areas per month. Households that do not pay any waste collection fee use other means to dispose of their waste which leads to illegal dumping in the environment. Businesses are charged between ₦30,000 – 50,000 (USD 20-30) depending on the location of the business, per single business permit monthly, by AEPB, a fee intended to also cover waste collection expenses.

There is NO transfer station available in the city, even though the distance from the farthest location to the disposal site is more than 20 km, limiting the efficiency of waste consolidation before final disposal. Waste collection in the city is twice a week and primarily handled by private sector companies, which must provide a specific number of trucks according to their contracts. Cleaning companies own an average of 3 - 4 trucks of different capacities between 12-18m³, but there are frequent mechanical breakdowns of these vehicles due to irregular maintenance schedules and the lack of adequate spare parts, AEPB has 2 functional compactor trucks and 2 which are not functional. Additionally, they have maintained a fleet of the four Lorries as a backup measure, which can be deployed if the private contractor fails to meet the requirements. Despite these arrangements, the lack of proper maintenance and

inadequate spare parts availability continues to affect the consistency and reliability of waste collection services in the city, indicating a pressing need for improved maintenance practices to enhance operational efficiency.

Table 2: Waste collection equipment in Abuja

Sub-county	Equipment	Qty	Functionality	Capacity	Frequency of collection
AEPB	Compactor Trucks	4	2 Functional 2 Unfunctional	12 - 18cm ³ ,	2 trips per week
AEPB	Roll on roll off trucks	Several		13 m ³	Now and then
Private companies	Waste Truck	4	Functional	12 - 18cm ³ ,	1 trip per week

There are several roll-on-roll-off trucks carrying buckets of 13 m³ capacity which are placed at markets, villages or areas prone to a high volume of waste with no clear contractor to manage. When they get damaged or old, AEPB replaces them immediately. Unwillingness to pay for waste collection fees has led to the proliferation of illegal disposal sites. The AEPB's ability to effectively manage waste collection is hampered by generators not contributing towards collection services.



Figure 7: Waste disposal trucks at Gosa dumpsite

The key challenges related to waste collection and transfer in Abuja are as follows:

- Lack of cost recovery mechanisms for sustainable waste collection services because waste generators are adequately charged for collection services, but they are not willing to pay.
- Mismanagement of waste by residents: In specific regions, despite the proximity of skips to residents, they opt for either discarding waste in drains or resorting to open burning. Moreover, sporadic collection delays by the county contribute to instances of waste being openly burnt.
- Insufficient equipment and PPE for workers such as street sweepers, drain cleaners, and manual loaders of collection vehicles.
- Inadequate roll on rolls off buckets.
- Lack of transfer stations in Abuja.

Potential Solutions to Address Waste Collection and Transfer Challenges.

- Infrastructure Development: Establish Waste transfer stations and expand roll-on roll-off infrastructure.
- Increase collection frequency and Implement management system.
- Digitalization and data system
- Community Engagement and behaviour change through public education campaign.
- Workforce Support through the provision of PPE, uniform, improve working tools and personal trainings.
- Informal Sector integration
- Financial and Institutional Reforms
- Encourage private investment in infrastructure and operations through transparent and accountable PPP arrangements.

Build waste transfer stations in strategic locations.

-Increase collection frequency to 3+ times per week in high-density areas.

-Improve fleet maintenance and tracking using GPS systems.

- Develop a smart waste data system for real-time monitoring.
- Formalize waste pickers and incentivize recycling initiatives.

-Community Education and Awareness Programs: Implement educational campaigns to inform residents about proper waste disposal methods and the environmental impacts of open burning and dumping waste in drains. Workshops, flyers, and social media outreach can help raise awareness and encourage responsible behavior.

-Improved Waste Collection Services: Enhance the waste collection schedule to ensure prompt and regular pickups. By reducing delays, residents will have a reliable option for disposing of their waste, minimizing the temptation to burn it or dump it improperly.

-Increased Accessibility to Waste Facilities: Consider increasing the number of waste skips or establishing designated drop-off points in areas where mismanagement is common. Making waste disposal facilities more accessible can encourage residents to use them instead of resorting to inappropriate methods of disposal.

Other options?

7.5.1.1 Waste recovery

According to the survey 1% of the total MSW generated in Abuja, is recovered, equivalent to 17 t/day. In Abuja, recovery activities are conducted by informal waste pickers who collect and accumulated recyclables (plastics, cans, papers/cartons, etc.) at waste collection points as well as disposal site. The collected materials from the disposal site by the informal waste collectors are sold to middlemen who then supply the recovery facilities. Over 100 waste pickers were sited working on the landfill, focusing mainly on recovering plastic, paper/cartons, metals, and selected glass bottles. There is a high volume of waste recovery processes in Abuja, harnessing the data is the problem. AEPB has no data base for all the aggregators recovering waste materials and many of them operate independently. For WaCT step 4, four recovery facilities were mapped and interviewed: Givo, Chanja Datti, Trans Abu, and Ecobater. It is believed that there are considerably more facilities, which were not able to be identified, as AEPB does not have their details.

Recyclables are collected from households by private companies and at the disposal facilities by waste pickers. Private companies are also engaged in the sales of recyclables from primary collection points. **There are no recycling companies** in Abuja, aggregators who collect waste materials resell to recycling companies in



Lagos, with no value addition. All surveyed recovery facilities are categorized as 'limited' or 'no control' according to the operational control ladder of WaCT.

The government needs to encourage recyclers to invest in Abuja

How to Improve Recycling in Abuja?

- Establish government-supported recycling hubs to encourage businesses to invest.
- Introduce incentives for private recycling companies (e.g., tax breaks, funding).
- Mandate waste separation at source to improve recycling efficiency.
- Encourage investment in plastic and e-waste recycling plants.

Figure 8: Informal plastic recovery at Gosa disposal site in Abuja.

The figure below shows the recovered materials in Abuja. Out of the total 17 tonnes/day recovered, 81% is plastic bottles PET, 2% is plastic HDPE, 9% is paper or cardboard, 5% is plastic LDPE & films, and 2% Metals.

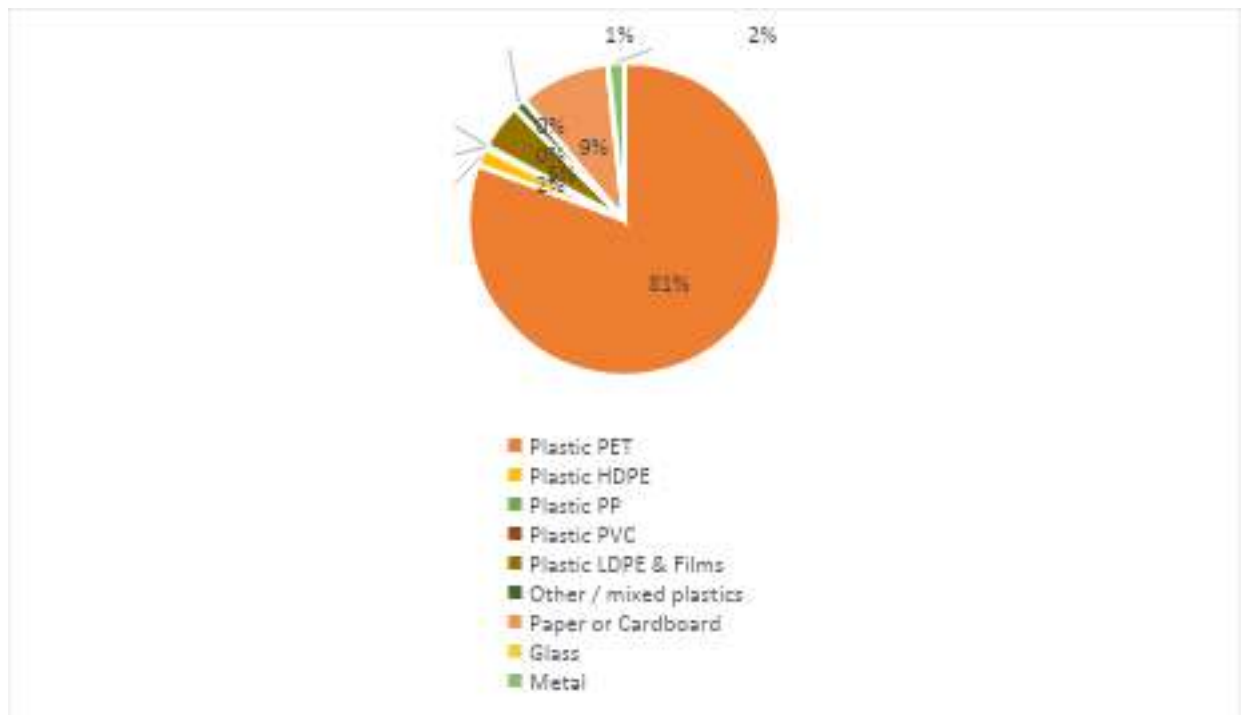


Figure 9: Breakdown of recovered materials in Abuja.

The following table summarises the potential number of recoverable materials in Abuja. Clean MRFs with a total capacity of 450 t/day could be established to harness recyclable materials. Organic waste treatment facilities (e.g. composting, biogas, black-soldier flies, etc.) with a total capacity of 900 t/day are needed to recover the organic waste generated in Abuja. It can be said that 50% of the materials can be realistically recovered if investment in collection and transportation systems is put in place together with proper source separation execution.

Table 3: Potential opportunities for waste recovery in Abuja

Waste Category	Potential by expanding waste collection services and recovery (t/d)
Kitchen/canteen	857
Garden/park	0
Paper/cardboard	69
Plastic film	136
Plastics dense	142
Metals	25
Glass	34
Textiles/shoes	36
Total	1,299

The primary challenges that contribute to the present low waste recovery rates include:

- Absence of waste segregation at the source.
- Lack of formalization and coordination of waste pickers.
- Inadequate equipment at disposal sites for separating various types of waste.
- Insufficient equipment (PPEs) for waste pickers and middlemen, to safely perform their tasks.

- Limited technical and financial capacity/resources for both the municipality and local waste actors to engage in waste recovery and recycling activities.

7.5.1.2 Waste disposal

There are 2 disposal sites in Abuja, Gosa and Karishi, Gosa being the main disposal site for Abuja city, while Karishi serves the surroundings outside Abuja.

Gosa disposal site opened in 2005, is located 34 km away from the city centre and it is very accessible by waste collection vehicles. It covers approximately 90.3 hectares in size and receives close to 1000 - 1500 tonnes of MSW per day. According to the WaCT methodology, it has a basic control level. The site does not have a complete fence around it but has a staff that regulates access to the site. There is a provision of a weighbridge on site but at the time of the survey, the equipment was not functioning. The only fees charged at the disposal site are the waste disposal fees, equivalent to 3% of the contract sum of each company working under AEPB. Companies that are not working under AEPB do not pay any fees for the disposal of waste on-site. The site is rarely on fire, but it happened on a few occasions when it was caused by the informal waste pickers living inside the disposal site trying to retrieve metals in order to sell them to junk shops. It is estimated that about 100 informal waste pickers are working to recover materials, like plastics, glass, paper cardboard, and metals, at the disposal site.



Figure 10: Kirishi (Left) and Gosa (Right) disposal sites in Abuja

The Karishi disposal site began operations between 2012 and 2015, being managed by a sister department of AEPB called the Satellite Town Development Department. The site is located 55 km away from the city centre and it spans an estimated 11 acres in size. It is easily accessible by trucks, and there is no tipping fees charged at this site. Unlike Gosa, the Karishi disposal site level of control is Limited control according to WaCT methodology.

The table below shows the operational criteria for the NO level of control set by Waste Wise Cities Tool met by the disposal sites. The requirements under the “No” answer are areas that could be further improved so the disposal sites reach the basic level of control.

Table 4: NO level of control area met by the disposal site in Abuja

Assessment areas	Questions	GOSA
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Security	Is there boundary and access control allowing a single point of supervised access	No
Water control	Is there any perimeter drainage maintained around the site	No
Slope stabilization	Are the slopes stabilized, mitigating the risk of landslide	No
Waste handling, compaction cover	Are waste trucks directed to a specific operational area of disposal	Yes
	Is there heavy mechanical equipment reliably available	Yes
	Is waste layered and compacted within the specific operational area	No
	Is there some use of cover material	No
Fire control	Is there zero evidence of burning waste on the surface of the landfill	No
Staffing	Are staff on-site during operational hours	Yes
Records	Is there a functional weighbridge in use	No
EHS	Are there toilets and hand washing stations	No
	Are basic personal protective equipment in use	No
Other	Is there a site drawing showing the landfill boundary and filling area	Yes

Assessment areas	Questions	KARISHI
Security	Is there boundary and access control allowing a single point of supervised access	No
Water control	Is there any perimeter drainage maintained around the site	No
Slope stabilization	Are the slopes stabilized, mitigating the risk of landslide	No

Waste handling, compaction cover	Are waste trucks directed to a specific operational area of disposal	Yes
	Is there heavy mechanical equipment reliably available	No
	Is waste layered and compacted within the specific operational area	No
	Is there some use of cover material	No
Fire control	Is there zero evidence of burning waste on the surface of the landfill	No
Staffing	Are staff on-site during operational hours	Yes
Records	Is there a functional weighbridge in use	No
EHS	Are there toilets and hand washing stations	No
	Are basic personal protective equipment in use	No
Other	Is there a site drawing showing the landfill boundary and filling area	No

7.5.2 Financing Gaps Analysis

7.5.2.1 Annual budget for MSWM in the city and estimated budget per tonne of MSW

The financing structure for Municipal Solid Waste Management (MSWM) in Abuja lacks clarity regarding the exact allocation and utilization of funds. In 2023, the Federal Capital Territory Administration (FCTA) allocated ₦ 11 billion (USD 15 million) for operations, which includes capital expenditures, management, and staff costs. However, it is unclear if this budget exclusively covers MSWM in Abuja or extends to a broader area within the FCTA's jurisdiction. Additionally, MSWM activities in the city generate income through tipping fees and waste collection services in the Central Business District (CBD). These services contributed ₦ 1 billion (USD 1.1 million) in 2023. Separately, an existing budget allocation of ₦ 7.5 billion (USD 4.54 million) per year is reported for MSWM. However, there is no detailed breakdown of this amount to determine how much is specifically allocated to waste management services such as collection, transport, or disposal. This lack of transparency in budget allocation makes it challenging to assess the adequacy of funding and prioritize investments for sustainable MSWM services in Abuja. If

FCTA's budget covers a larger area beyond Abuja, further disaggregation is essential to ensure that MSWM activities in the city are adequately financed.

To enhance transparency in budget allocation in Abuja, consider the following strategies:

Budget Tagging and Tracking

- Implement a budget tagging system, similar to the nutrition budget tagging initiative, to track allocations and expenditures for specific sectors or programs
- Utilize technology to enable real-time tracking and monitoring of budget implementation

Public Engagement and Participation

- Engage citizens through public forums, town hall meetings, or online platforms to provide information on budget allocation and expenditure
- Foster a culture of transparency and accountability by involving citizens in budget decision-making processes

Data-Driven Decision Making

- Leverage data analytics to inform budget decisions and track the effectiveness of budget implementation

- Publish detailed budget reports and analysis to facilitate transparency and accountability

Institutional Reforms

- Strengthen institutions, such as the Ministry of Budget and Planning, to ensure effective budget management and oversight
- Enhance the capacity of budget officers and other stakeholders to manage and track budget implementation

Technology-Based Solutions

- Develop online platforms, like BudgIT, to provide accessible and user-friendly information on budget allocation and expenditure
- Utilize infographics, reports, and analysis to facilitate citizen understanding of budget data

Collaboration and Partnerships

- Foster partnerships between government agencies, civil society organizations, and private sector entities to promote budget transparency and accountability
- Encourage collaboration and knowledge sharing to leverage best practices in budget management

7.5.2.2 Household Waste Collection Fees and Total Income for MSWM

In Abuja, it is estimated that 65% of households receive waste collection services, paying an average monthly collection fee of ₦ 2,000 (USD 1.3), depending on their income level. These fees contribute significantly to the overall funding for the

Municipal Solid Waste Management (MSWM) system. Waste collection fees are typically collected by private companies contracted by the municipality for service provision. The total financial resources flowing into the MSWM system in Abuja include:

Income from MSWM Activities: Revenue generated from tipping fees and waste collection services, particularly in the Central Business District (CBD), amounting to ₦ 1 billion (USD 1.1 million) annually.

Annual Municipal Budget for MSWM: Allocated by the Federal Capital Territory Administration (FCTA), with ₦ 7.5 billion (USD 4.54 million) designated for MSWM activities.

Estimated Waste Collection Fees from Households: The combined fees paid by households for collection services form an essential part of cost recovery for waste management.

While these funding streams contribute to the MSWM system, there is insufficient data to determine if the collected fees and allocated budgets are adequate to sustainably manage waste across Abuja. Additionally, below is a summary table to show a clearer breakdown of how funds are utilized within the system is needed to ensure financial transparency and efficient resource allocation.

Table 5: Summary of budget of MSWM Abuja city and Estimated budget per Tonne of MSW.

Budget Source	Amount (₦)	Amount (USD)	Per Tonne (USD)
Municipal Budget (FCTA)	3.405 billion	4.54 million	9.5
Household Collection Fees	7.08 billion	9.44 million	19.8
MSWM Activities Income	825 million	1.1 million	2.3
Total	11.31 billion	15.08 million	31.6

The total budget allocated for managing one tonne of MSW in Abuja is approximately **USD 31.6 (₦23,700)** per tonne, combining all funding sources. The corresponding total budget for MSWM operations in Abuja is **USD 15.08 million (₦11.31 billion)** annually. The municipal budget allocated to manage one tonne of MSW generated in

Abuja is approximately **USD 9.5 (₦7,125)**. When the waste collection fees collected by private waste collectors are included in the calculation, approximately USD 19.8 (₦14,850) is spent per tonne of MSW. Additionally, income from MSWM activities contributes approximately USD 2.3 (₦1,725) per tonne of MSW. In total, the funds budgeted for MSWM in Abuja, including the municipal budget, household fees, and income from MSWM activities, amount to approximately USD 31.6 (₦23,700) per tonne. This amount covers the collection, disposal, and recovery of MSW in Abuja.

Allocating resources to improve solid waste management infrastructure in Abuja presents a significant challenge due to the disparity between available funding and the substantial resources required to achieve desired outcomes. The current budget allocations fall short of meeting the comprehensive needs for upgrading waste collection systems, establishing recycling facilities, and implementing effective disposal methods to meet the growing demand for Abuja. As a result, the expected outcomes of improved waste management efficiency, reduced environmental impact, and enhanced public health may not be fully realized. To bridge this gap, there is a critical need for increased financial investment, innovative funding mechanisms, and strategic partnerships to mobilize additional resources and ensure sustainable progress in solid waste management practices across Abuja FCT. Only through collaborative efforts and enhanced resource mobilization can the county effectively address these infrastructure gaps and achieve its waste management goals in a meaningful and impactful manner.

For Abuja to expand collection coverage from 57% to 100%, the financial resources entering the solid waste management sector (either via fees or budgetary allocation) would need to be significantly increased. A budget allocation of around USD 8 per tonne of waste received by the landfill site should be planned to transition the current open dumping practice to a basic controlled disposal facility. Introducing separate collection and sorting at Material Recovery Facilities (MRFs) or Transfer Stations (TSs) will add approximately 10-20% to the collection cost. However, investment in recovery systems such as MRFs/TSs can reduce the total waste received by disposal facilities, thereby lowering transport and disposal costs and contributing to overall savings in solid waste management expenditure.

7.5.2.3 Sources of revenue and revenue collection mechanisms

Municipal Solid Waste (MSW) collection services in Abuja are provided by franchise companies within the Central Business District (CBD), while the Abuja Metropolitan Council oversees waste collection in major markets and highways. The Abuja Environmental Protection Board (AEPB) is responsible for setting the waste collection fee rates. However, these fees are collected directly by the private franchise companies that provide the waste collection services, not by AEPB.

Table 6: Sources of revenue collection in Abuja

Category of Area	Collection fee (Households per 85 litter bins) once per week	USD	Collection fee (Businesses)	USD
Low Income	₦ 1,000 / Month	0.7	₦ 30,000 / Month	20
Medium Income	₦ 2,500 / Month	1.7	₦ 40,000 / Month	26.6
High Income	₦ 3,750 / Month	2.5	₦ 50,000 / Month	33.3

7.6 Recommendations

Based on the WaCT survey results and stakeholder's engagement, key intervention areas for the improvement of the SWM system identified in Abuja are to expand the waste collection coverage and control management of disposal sites. This could be achieved through the actions described below.

- **Developing MSWM strategies and master plans** will be the first step for identifying areas of interventions listed below with more details in addition to regulatory frameworks. The plan can incorporate feasibility studies and/or business models for the listed interventions to be implemented.

Strengthening the MSWM collection services through bylaws/ordinances for MSW collection in Abuja: The bylaw/ordinance should mandate households and commercial entities to pay monthly waste collection fees to the licensed operators. This should be based on a clear definition of waste collection services, determined fee structure, and associated penalties. Different options for the revenue collection mechanisms could be explored (i.e. direct fee collection from households and commercial entities/integration of waste collection fees into other utility bills). This would allow the establishment of sustainable financial mechanisms or small-scale business models that would include subsidies to ensure cost recovery for CBOs or youth groups doing the collection.

- **Strengthening waste collection by AEPB,** including purchase and proper maintenance of waste collection vehicles and repairs of broken ones. PPE provision and tools for the workers, in addition to upgrading the design of waste collection vehicles with covers with tarpaulins or makeshift nets to prevent spillage of waste, are important.
- **Licensing waste collection groups and integrating the informal sector** is a necessary process for formalizing the informal youth groups and CBOs who are engaged in waste collection and/or recovery activities. Registering the CBOs and give licenses to charge for waste collection is an important step in their formalisation process. These groups should be provided with access to healthcare, pension schemes, PPEs, etc, recognizing the vital role these individuals play in the city's waste management system and improving their overall well-being and livelihoods. A similar system could be applied to privately operating waste collection companies.
- **Provision of small-scale resource recovery centers to licensed youth groups/operators:** Small-scale material recovery and transfer stations could be built and operated by licensed youth groups who sort and sell recyclables more efficiently. In urban and town setting areas where households do not have gardens, those sites could be combined with small-scale processing facilities for organic waste and urban agriculture activities.

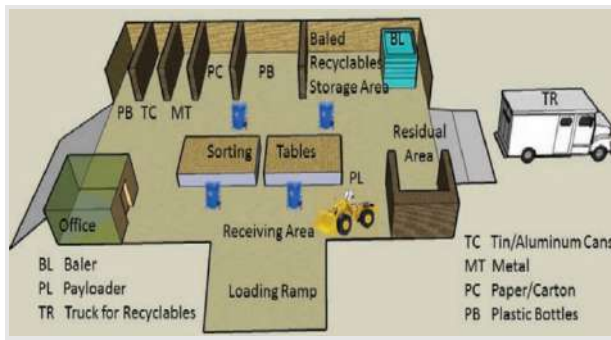


Figure 11: Examples of containerized composting (left-up, left-down, and middle-down), small-scale material recovery and transfer station (right-up),¹ and small-scale bio-digester (right-down)²

¹ ADB, 2013 [Material Recovery Facility Toolkit](#)

² RWA Group “Decentralizing Recovery/Recycling System” option cards

- **Promotion of home composting** could be an effective measure to reduce MSW generation from households because more than 62% of household waste is organic. This could be promoted particularly in the rural setting where households have gardens. This would reduce the MSW generation to be collected by the county government drastically, saving the county government's budget for fuel and vehicle maintenance. In a recent study conducted by Jalalipour et al (2025) on home composting in Shiraz, Iran, they found that home composting has several environmental benefits. They found that it decreases the environmental impact of organic waste management, reduces energy consumption in transporting waste to landfills.
- **Sensitization and awareness raising on the importance of MSWM**, especially on the no-no littering, segregation at source, home-composting, and importance of waste collection fee payment. Activities like school programs or painting of waste collection receptors with children could be introduced in all the areas in the FCT. Hassan (2004) in his study of the US found that raising awareness is key to effective solid waste management. This is because public sensitisation also drives community engagement.
- **Source separation.** The introduction of a separate household collection of wet and dry waste would support efficient resource recovery, allowing organic waste to be turned into compost and recyclable materials to be processed and reused. Communal collection points could introduce three collection containers – organic waste, recyclables, and residuals, for more efficient recovery of resources(The Kinondoni Women's Development Trust (KIWODET) successfully implemented a composting operation for commercial organic wastes in Dar es Salam (Oberlin and Szanto, 2011). Their waste collection and sorting eeforts led to effective composting practices, contributing to sustaianable waste management in the community. They however failed to achieve public acceptance of collecting waste seperately. This may be an aspect Nigeria have to work on to sensitize the public on the importance of collecting waste separately. More so, Brrazil has been able to utilise waste pickers into its SWM. (Mally and Jphnson,2024). The initiative for instance encourages recycling – sustainable environmental practice and has

equally created employment opportunities for its people. Another successful implantation is in the municipality of Teocelelo in Mexico (De Medina -Sales et al. 2020). They focused on waste separation and composting. Residents actively participated in separating organic waste which was then processed into compost at a local vermicomposting plant. This initiative has improved the environmental conditions of the community. For Nigeria to be successful, there is a strong need to sensitize and engage the community. (Oberlin and Szanto 2011).

Turning Karishi dumpsites into “basic” controlled disposal sites, through the provision of access roads, construction of cells, drainage, leachate collection and pond, etc. The criteria for the ‘basic control’ of disposal facilities provided in this report will be guiding principles for improving the operational control of the uncontrolled disposal site. There is also a need to identify new locations for integrated sanitary landfill sites and establish a system to check on control levels at disposal sites.

- **Strengthening the capacity of solid waste management actors in the entire chain through regular waste management stakeholder dialogue forums** is required for the effective implementation and enforcement of regulations. This is particularly important to harness and foster the shared knowledge and expertise among the local stakeholders in the MSWM chain.
- **Infrastructure investment:** Increase waste collection fees on high-income and commercial outlets to strengthen AEPB's ability to cross-subsidize waste collection services in low-income communities. **Also, volume based waste fee can also be introduced create an equitable waste fee for users.** Vietnam has enacted this into law, hence, fees charged is based on waste generated.
- Develop community waste sorting centres in low-income communities and medium-scale material recovery facilities in the Garki area and encourage the use of standardized waste storage bins at households and commercial outlets
- **Waste recycling:** Household waste sorting should be encouraged to improve the waste diversion process by recycling vendors and companies.

Public-private partnership schemes should be encouraged to improve investment for waste recovery businesses.

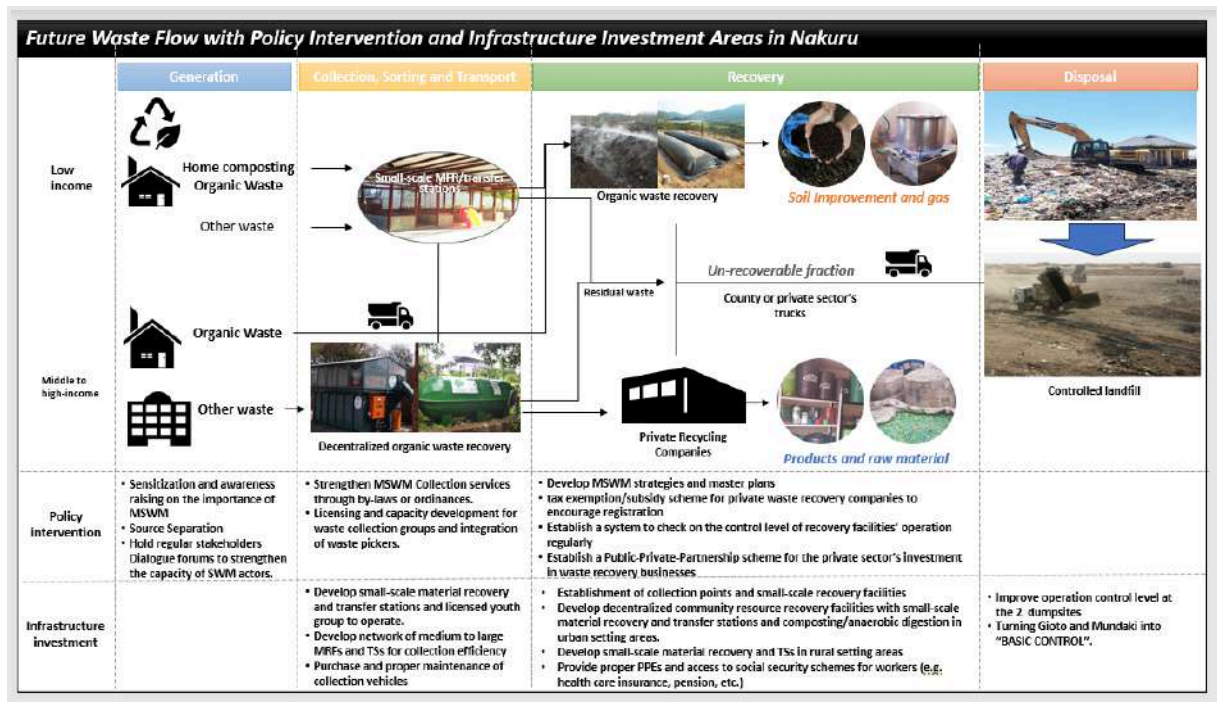


Figure 12: Future Waste Flow for Abuja Nigeria with identified policy interventions and infrastructure investment areas through WaCT application.

NEED ASSESSMENT IN NIGERIA USING FINDINGS FROM THE UN-HABITAT WaCT FINDINGS OF ABUJA, NIGERIA

8.1 Infrastructure Needs for Waste Management Improvement

8.2 Policy and Regulatory Needs for Waste Management Improvement

Policy and regulatory reforms are necessary to address gaps in waste management in Abuja. Strengthening the legislative framework, reviewing existing laws, enhancing enforcement mechanisms, and demonstrating political will and financial commitment are crucial steps. These reforms will improve waste management governance, ensure compliance with regulations, and provide the necessary support for effective waste management initiatives.

8.3 Financial Needs for Waste Management

Limited financial resources pose a significant challenge for waste management in developing countries like Nigeria. Innovative financing mechanisms, such as green bonds and environmental impact bonds, can attract investment from sustainability-conscious individuals and institutions. Adopting a Green Taxonomy can align national efforts with global sustainability benchmarks. Addressing financial institutions' hesitance to provide loans is crucial, with strategies like government guarantees and capacity-building programs. Fostering public-private partnerships (PPPs) can diversify funding sources and leverage private expertise. A comprehensive approach integrating legal, financial, and institutional innovations is essential for advancing sustainable waste management practices in Nigeria.

8.4 Technological Needs for Waste Management Improvement

Investments in technology are essential to modernize waste management practices in Abuja. Training and education programs, digital waste management systems, and the adoption of innovative technologies will enhance the capabilities of waste workers, improve communication and coordination, and optimize waste management processes. Leveraging digital solutions will lead to more efficient waste collection, recycling, and disposal, contributing to a cleaner and healthier environment.

8.5 Socioeconomic Needs for Waste Management Improvement

Addressing socioeconomic challenges is vital for improving waste management in Abuja. Providing financial stability and support programs, education and skill development opportunities, occupational health and safety protocols, legal recognition and inclusion, awareness and sensitization campaigns, and access to personal protective equipment are essential initiatives. These measures will empower waste workers, protect their rights, enhance their well-being, and promote inclusiveness and dignity within the waste management sector.

9. RECOMMENDATIONS

9.1. Invest in Infrastructure Development

9.2. Utilize Innovation and Technology

Embracing innovative technologies such as mobile apps, smart sensors, and digital waste management systems can revolutionize waste collection, monitoring, and recycling efforts. Research and development initiatives should be prioritized to create locally relevant technological solutions tailored to Nigeria's waste management challenges.

9.3. Encourage Inclusive Practices

Public participation is crucial for effective waste management in Nigeria. It increases awareness, fosters ownership, and encourages community involvement. A comprehensive legal framework is needed to ensure public involvement in waste management planning and implementation. Coordination mechanisms between government agencies, local communities, and businesses can streamline waste management efforts. Creating forums for dialogue and incentivizing public participation can help build trust. Governments can introduce rewards for sustainable waste practices. Education campaigns can raise awareness about waste reduction and sustainable practices, instilling a culture of sustainability. Schools and community organizations can act as intermediaries between the public and policymakers, advocating for sustainable waste management solutions.

9.4. Promote International Cooperation

Collaboration with international organizations, donors, and partners can enrich Nigeria's waste management practices by leveraging global best practices and experiences. Knowledge sharing, technology transfer, and capacity building efforts can enhance sustainable and inclusive waste management outcomes nationwide. An example is South Africa's Green Outcomes Fund (GOF) initiative that incentivises regional fund managers to invest in sustainable firms to foster corporate expansion and employment development. Created in partnership with the World Bank, WWF-SA, GreenCape, and the Bertha Centre for Social Innovation and Entrepreneurship at the. The fund allocates financial resources based on established environmental objectives, encompassing waste management, renewable energy, green

employment creation, and carbon dioxide emission reduction. This connects private sector involvement with sustainable development objectives.

9 Implement Microfinance and Income Support Programs

Developing microfinance and income support programs tailored to the needs of informal waste workers can provide financial stability and empowerment. Cash transfers, savings groups, and small loans can help informal waste workers improve their livelihoods, reduce poverty, and contribute to sustainable waste management efforts.

9.Enforce Occupational Health and Safety Regulations

Enforcing occupational health and safety regulations is crucial for protecting informal waste workers from workplace hazards. Providing personal protective equipment, training on safe waste management practices, and ensuring access to medical care are essential steps to safeguard the health and well-being of waste workers.

9.Conduct Awareness and Sensitization Initiatives

Launching awareness and sensitization campaigns can combat stigma and misconceptions surrounding informal waste workers. Educating the public, media, government agencies, and civil society organizations about the important role of informal waste workers can foster a more supportive and accepting environment. Engaging local communities in waste management initiatives is crucial for sustainable practices and addressing residents' needs. Strategies like community engagement forums and participatory budgeting can facilitate dialogue between government officials and local communities, ensuring development initiatives align with the populace's desires.

9.Provide Thorough Training Courses

Implementing formal training programs for informal waste workers can enhance their skills and knowledge in waste management strategies, recycling practices, waste segregation, and occupational health and safety regulations. Hands-on training and accessible training materials are essential for building the capacity of waste workers.

9 Collaborate with Stakeholders

Establishing partnerships with government agencies, private sectors, civil society organizations, and international partners is crucial for the success of waste management initiatives. Involving informal waste workers in the design and implementation of programs ensures relevance and effectiveness. Promotion of active involvement of communities during conception, planning and implementation of solid waste management programs.

9.1

9.1 Review Punishment in Regulations

Amending existing environmental laws to incorporate stricter penalties and up to date fines for environmental offenses will enhance deterrence and compliance. Strengthening punishment provisions will discourage potential offenders and promote adherence to environmental regulations.

9.1 Domesticating International Environmental Laws

Prioritizing the domestication of international environmental conventions will ensure alignment with global standards and drive legislative efforts at the state level. Domestication of these laws will enhance environmental protection measures and support sustainable waste management practices in Nigeria at the federal level.

9.1 Collaboration of both the Federal and state government

Nigeria's federal legal framework and state-level legal systems are in a significant gap, affecting waste management initiatives and other policies. To bridge this, reforms should encourage cooperation and create a unified legal structure. One solution is a national policy directive setting minimum standards for waste management, which states must incorporate into their legal frameworks. An intergovernmental forum for legal coordination, technical assistance, and constitutional amendments could also help. These recommendations aim to strengthen governance, enhance policy implementation, and promote a cohesive approach to addressing complex challenges like waste management and environmental sustainability.

10. CONCLUSION

Nigeria has a well-established solid waste management legal framework because of numerous laws and regulations aiming at environmental protection, particularly around solid waste. However, there is no comprehensive national law governing solid waste management. While present environmental laws and regulations give general recommendations, no specific legislation or enforcement mechanisms exist to address the complex difficulties associated with solid waste management. Certain laws, such as the National Environmental Standards Regulatory and Enforcement Agency Act of 2007 and the Federal Environmental Protection Regulations of 1988, have penalties that fail to achieve their intended deterrent effect. The inefficiency of solid waste management in Abuja is due to a few problems, related but not including poor enforcement of environmental laws and policies, a lack of understanding about the benefits of a circular economy, and the need to reduce waste. From the foregoing, it can be inferred that Nigeria is still in its nascent stage to tackling environmental issues. This means that Nigeria has a lot of potentials it can tap from in putting Abuja as the pacesetter in tackling waste management.

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