RMI LAWMA LAGOS WASTE MANAGEMENT AUTHORITY WASTEMAP

Overcoming Regulatory Barriers to Closing Dumpsites and Implementing Sanitary Landfills in Lagos, Nigeria

Key policy recommendations to safeguard human and environmental health and support methane mitigation

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About Us

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Established in 1977, the Lagos Waste Management Authority (LAWMA) oversees the regulation and operation of solid waste management in Lagos State. It aims to improve environmental sustainability and cleanliness through adaptable waste management solutions. LAWMA's activities encompass establishing standards and enforcing waste management regulations, fostering and maintaining partnerships with private sector stakeholders, conducting advocacy campaigns, overseeing street cleaning, and more, all aimed at managing waste collection, transportation, treatment, and disposal in Lagos.

The Waste Methane Assessment Platform (WasteMAP), a joint initiative by RMI and Clean Air Task Force, is an open online platform that brings together waste methane emissions data with decision support tools for stakeholders in the waste sector. The platform is supported by country engagement that involves collaboration with national and subnational governments, waste management officials, and other key decision makers to provide capacity building and technical assistance — providing a pathway to reduce solid waste methane emissions. Please visit our website https://www.wastemap.earth/ to learn more.

The Global Methane Hub organizes the field of philanthropists, experts, nonprofits, and government organizations to ensure we unite around a strategy to maximize methane reductions. We have raised over $200 million in pooled funds from more than 20 of the largest climate philanthropies to accelerate methane mitigation across the globe. Visit www.globalmethanehub.org to learn more about organizations that support the commitment.

Table of Contents

Key Takeaways

Overcoming regulatory barriers to closing dumpsites and implementing sanitary landfills in Lagos, Nigeria

In regions where waste is primarily disposed of in dumpsites, upgrading to sanitary or engineered landfills is essential to mitigate risks to human and environmental health. For Lagos State, this transition is also critical to meeting its waste management and emissions reduction goals.

Upgrading dumpsites to landfills presents numerous challenges, often exacerbated or caused by the lack of a comprehensive policy framework necessary for effectively planning the systematic shift in waste disposal.

Identifying key policy gaps in Lagos and drawing lessons from frameworks in other countries that have successfully implemented sanitary landfills offer valuable insights on bridging these gaps and supporting an efficient and equitable transition.

This regulatory barriers analysis employs this approach to develop policy recommendations that will facilitate the effective closure of dumpsites and the implementation of sanitary landfills in Lagos.

01 **This transition will advance Lagos' waste management targets and climate goals and has government buy-in.**

02 **Such transitions are lengthy and necessitate sustained effort.**

03 **This transition requires effective alignment and management of key stakeholders.**

04 **This transition requires robust and enabling policy frameworks to facilitate implementation and this analysis offers key policy recommendations that address various aspects of the transition.**

Introduction

Lagos State is home to 10% of Nigeria's population, and Lagos' population is expected to double by 2050.[1] Currently, Lagos generates over 13,000 tonnes of municipal solid waste (MSW) every day, and this is expected to increase in the coming years. With minimal recovery and treatment, most of this waste is disposed of at one of Lagos' five active dumpsites,* located in densely populated areas.[2]

These dumpsites contaminate soil, air, and water with methane, heavy metals, per- and polyfluoroalkyl substances (PFAS), and other toxins, which pose serious environmental and public health risks. The leaching of toxins into the ecosystem causes biodiversity loss and eutrophication.[3] Residents near dumpsites disproportionally face increased risks of illnesses, such as asthma, skin irritation, malaria, and cholera.[4]

Closing dumpsites and transitioning to sanitary landfilling for final disposal is an effective way to mitigate these risks. Replacing dumpsites with engineered landfills is identified as a milestone in Nigeria's National Roadmap on Solid Waste Management. Additionally, Lagos State identifies the conversion of open dumpsites into sanitary landfills that capture landfill gas (LFG), which is comprised of approximately half methane and half carbon dioxide, as a planned action within its climate action plan.[5]

However, this transition is time-consuming and resource-intensive and involves aligning multiple stakeholder groups. An enabling policy and regulatory environment is indispensable for planning and implementing this transition effectively and equitably.

This report examines opportunities for creating an enabling policy environment, one that facilitates closing existing dumpsites and developing new sanitary landfills. However, waste management improvements must be situated within an integrated waste management system that prioritises source reduction and waste diversion, thereby minimising reliance on final disposal facilities and promoting a sustainable waste management system.

* "Dumpsites" refer to both open (uncontrolled) and controlled waste disposal sites.

Overview and Objectives

Audience

This report is intended for waste management officials, policymakers, and regulators in the state of Lagos, Nigeria, who are looking to transition solid waste disposal in their municipality from dumpsites to sanitary landfills. Although tailored to Lagos, the policy recommendations also apply to other Nigerian states.

Scope

The policy and regulatory barriers analysis examines factors that may hinder the effective and equitable closure of dumpsites and sanitary landfills development in Lagos, Nigeria. It provides recommendations for more robust frameworks promoting sustainable solid waste management and methane emissions mitigation. To do this, we evaluated the policy and regulatory landscapes that govern dumpsite and landfill management in select countries and compared them with those in Lagos, Nigeria. Specifically, the report analyses enforceable laws, such as acts, regulations, statutes, and policies, which serve to guide decision-making and the creation of law.

Goals

Through this report, we identify key policy and regulatory gaps that should be addressed to accelerate the transition to sanitary landfills and provide recommendations on how to bridge these gaps. We hope this report helps inform policymakers and regulatory agencies about how to establish and improve frameworks that will facilitate an equitable and efficient transition.

01 Process and Timeline for Transitioning from Dumpsites to Sanitary Landfills

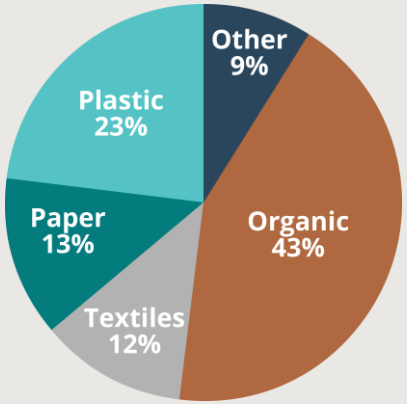
Overview of the current MSW management landscape in Lagos

LAWMA both regulates and, according to the Environmental Management and Protection Law of 2017, oversees local waste management operations across the value chain.[6]

Generation

With an average waste generation of 0.61 kg/person/day, Lagos produces over 13,000 tonnes of solid waste daily, accounting for 15% of Nigeria's total.[7] Organic waste makes up 43% of the waste stream.[8]

MSW composition in Lagos



RMI Graphic. Source: *Guide for Recycling Activities in Lagos, Nigeria*, LAWMA, December 2020

Collection & transport

Lagos has a 40% collection rate, and uncollected waste is sometimes illegally dumped or burned.[9] Waste is collected weekly using a single-bin system. Waste collection is often contracted to private sector collectors, both for door-to-door collection services and for collecting recyclables from bulk generators. Currently, segregated waste collection is uncommon; there is no source separation of organic waste and limited separation of recyclables.

Collected, non-diverted waste is then transported to dumpsites across Lagos, with about 50% of collected waste transported to Olusosun dumpsite, which is the largest dumpsite in the city.[10]

Recovery & treatment

Waste treatment is limited with minimal recovery of recyclables and organic waste.

Recycling operations occur at a centralised material recovery facility operated by WestAfricaENRG. Further, waste pickers recover recyclables from dumpsites and sell to operators who collect, preprocess, or transform recyclables into new products.[11]

Organic waste is typically disposed of at dumpsites however, some treatment operations exist. These include a commercial compost plant (EarthCare Nigeria Limited), household composting, small-scale biogas plants, and using food waste for agricultural inputs, like fertiliser and animal feed, as is done by Waste2Table, black soldier fly treatment facilities, and MagProtein Nigeria Limited.

Disposal

There are no sanitary landfills in Lagos. Waste is disposed of at dumpsites with little to no environmental controls that are owned and operated by LAWMA.

In 2021, dumpsites or illegally dumped waste contributed to about 12.5% of Lagos' emissions.[12]

The city is assessing options to close its dumpsites and develop sanitary landfills to facilitate a more sustainable waste management system.

Phasing out dumpsites in Lagos should be part of an integrated waste management system

According to the waste management hierarchy, waste disposal is the least desirable option for managing solid waste. However, in regions where waste is predominantly disposed of in dumpsites, upgrading to sanitary or engineered landfills is crucial to mitigate risks to human and environmental health. Lagos' goal of replacing its dumpsites with sanitary landfills, as well as its broader waste management and emissions reduction goals, are best achieved through an integrated solid waste management approach that follows the waste management hierarchy to align its waste disposal improvements with advancements in other parts of the waste management system. This approach considers the entire waste value chain, accounts for local context, involves all key stakeholders, and prioritises source reduction and waste diversion.[13] Using this approach, Lagos can reduce its reliance on final disposal facilities, improve resource recovery, and promote a more sustainable waste management system.

National and subnational waste goals

Nigeria's waste goals

Reduce emissions

- Achieve net-zero emissions between 2050 and 2070
- Reduce both open burning and methane recovery from landfills by 50% by 2030[14]

Increase waste diversion

- Prioritise waste reduction and diversion efforts to reduce reliance on final disposal sites, and increase recycling by 15% by 2030[15]

Improve waste disposal

- Replace dumpsites with engineered landfills[16]

Lagos' waste goals

Reduce emissions

- Reduce waste disposal emissions by at least 30% by 2030 and achieve a 20% LFG capture rate by 2050[17]

Increase waste diversion

- Reduce open burning and dumping of organic waste by 50% by 2050[18]
- Treat 30% of organic waste by 2030 and 50% by 2050 using composting. Achieve an organic waste treatment capacity of 20,000 tonnes/day by 2030[19]

Improve waste disposal

- Decommission five dumpsites and commission a sanitary landfill with LFG capture by 2030[20]

Benefits of an integrated waste management approach for waste disposal improvements

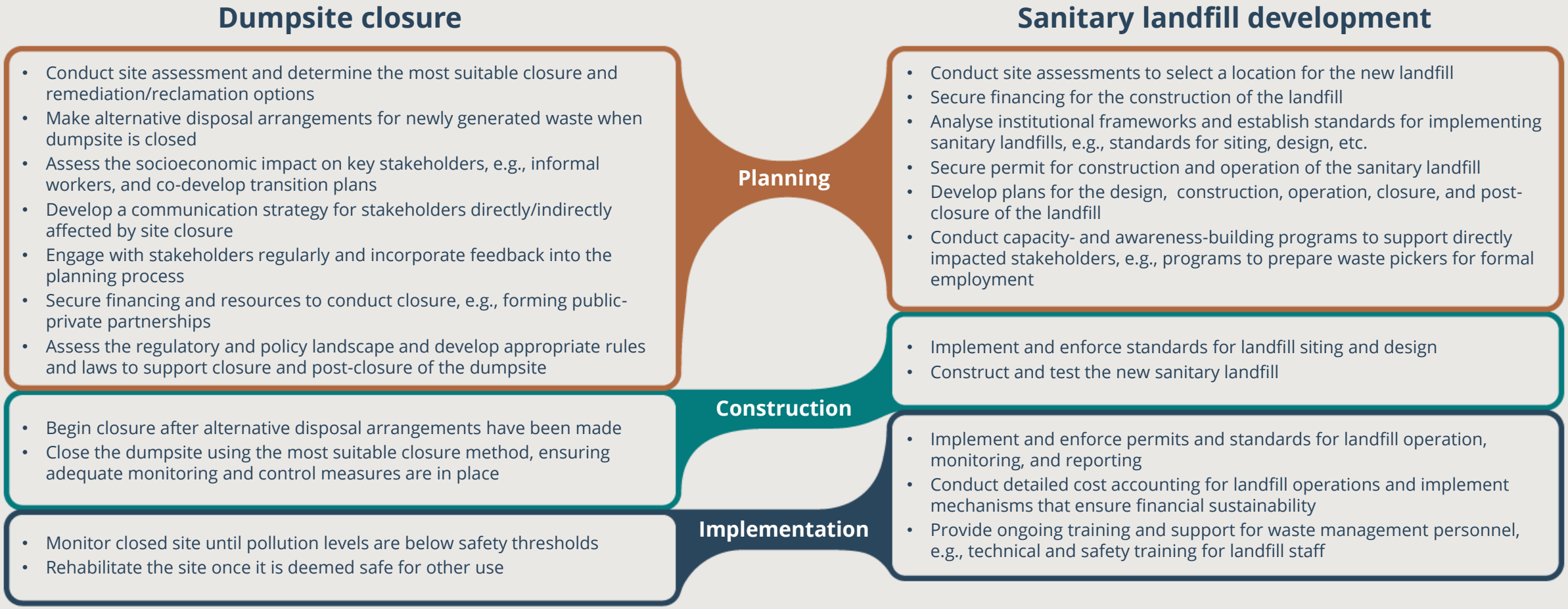
Reduced local pollution and greenhouse gas emissions, which improve public health and lessen potential resistance from nearby communities

Extended landfill lifespan from reduced waste disposal volumes resulting from source reduction and increased waste diversion

Reduced operational costs from processing smaller volumes of disposed waste, which can improve project economics and sustainability

Added jobs and strengthened end markets for waste-derived products, like recyclables and compost, which can improve cost recovery, decrease social resistance related to threats to livelihood, and promote stakeholder inclusion, such as through the integration of informal workers within the formal waste management system

Closing dumpsites and developing sanitary landfills are complex processes and can be broadly categorised into three phases



Note: These lists are simplified to provide a general overview of what is involved in closing a dumpsite and constructing a sanitary landfill. The steps listed within each phase are not in order of conduct.

RMI Graphic. Source: ISWA, https://www.iswa.org/closing-the-worlds-biggest-dumpsites-task-force/?v=7516fd43adaa; City of Brasília, https://www.c40knowledgehub.org/s/article/How-we-closed-the-second-largest-dumpsite-in-the-world?language=en_US

Site assessments are necessary to determine the most suitable method to close dumpsites and construct new sanitary landfills

In-place closure with remediation and rehabilitation

For this method, waste is covered and revegetated, which helps restore the site's ecological health over time. End-use options for in-place closure depend on site conditions and legal requirements.

Planning considerations

- Is there a suitable alternative for disposing of newly generated waste? Or can the dumpsite be closed after the new landfill is operational?
- Is there capacity to monitor and address the migration of gas and leachate?

Removing existing waste

In this method, waste in place is removed from the site and taken to another site, ideally a sanitary landfill, for final disposal. When followed up with appropriate monitoring, remediation, and rehabilitation, this method prepares the site for a variety of end uses when it is safe to use.

Planning considerations

- What methods can effectively clean the site?
- Will nearby communities be affected by traffic, dust, or odour?
- How does the land value compare to the cost of waste removal?

Sanitary cells

These cells are used to transform dumpsites into sanitary landfills using adjacent plots of land to deposit, compact, and cover processed waste from the original dumpsite.

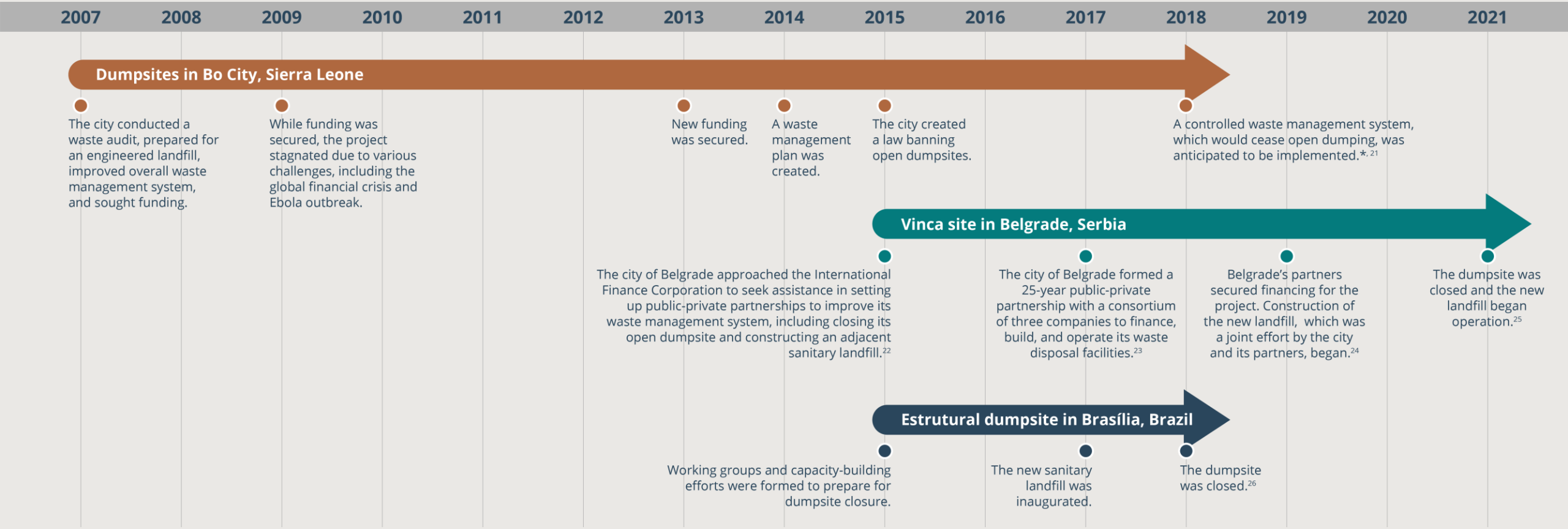
Planning considerations

- Is there available space for the sanitary cells next to the dumpsite?
- Is there adequate space between the sanitary cells and the surrounding community?
- Are current site characteristics appropriate for landfilling activity?

RMI Graphic. Source: ISWA, https://www.iswa.org/closing-the-worlds-biggest-dumpsites-task-force/?v=7516fd43adaa; EPA, https://www.epa.gov/sites/default/files/2015-07/documents/close05.pdf

This multiphased process requires a long-term commitment

Infrastructural development is critical to transitioning from dumpsites to sanitary landfills. However, the need for supporting mechanisms such as policies, regulations, standards, and the alignment of key stakeholders across the value chain cannot be overstated and can lengthen the process. The effective implementation of sanitary landfills requires sufficient time for the waste management system to adapt to new information, rules, and practices. Below, we present case studies from Latin America, Europe, and Africa.



*It is unclear if this has been implemented.

02 Challenges with Sanitary Landfill Transition and Impact on Key Stakeholders

Several stakeholder groups are affected during the process, each with varying degrees of impact and influence

Below, we explore the impacts of closing dumpsites and building new sanitary landfills on various stakeholder groups. While sanitary landfills are more environmentally friendly than dumpsites, building sanitary landfills can have negative consequences for the environment and surrounding community, such as land depreciation, odour, and noise pollution. An integrated waste management approach can reduce these impacts by prioritising material recovery upstream and ultimately reducing the reliance on landfills.

Directly impacted

Key stakeholders	Potential impact on those immediately affected by the process
Informal workers	**Dumpsite closure** could result in displacement and loss of livelihood. **Sanitary landfills** create opportunity for transition to formal roles within the waste management system.
Residents/ communities	**Dumpsite closure** can result in improved resident health and community conditions from less pollution/ hazards, e.g., lower risk of disease and pests. **Sanitary landfills** can result in noise, pollution, and traffic from landfill.
Landowners	**Dumpsite closure** could increase the property value of surrounding areas upon rehabilitation of the site, e.g., adding property value by rehabilitating land into a park. **Sanitary landfills** can sometimes decrease surrounding land value.

Concerned

Key stakeholders	Potential impact on those who have a personal stake in the process
Waste management personnel/ contractors	**Dumpsite closure and sanitary landfills** require changes to practices, contracts, and services.
Local businesses	**Dumpsite closure** could improve the business environment due to reduced pollution/ hazards, e.g., decreased odour, which could increase the customer base for local businesses. **Sanitary landfills** often raise waste disposal fees, which could increase business expenses; landfill siting could displace or lower customer volume for businesses in surrounding areas.
Taxpayers/ residents	**Dumpsite closure** reduces pollution hazards, which improves community health conditions, e.g., lower risk of disease and pests. **Sanitary landfills** raise disposal costs, which are often passed down to users; residents may also be affected by odour and traffic around the site.

Influential

Key stakeholders	Potential impact of those who can guide implementation
Local municipality	The local municipality manages the **dumpsite closure** process, as well as post-closure maintenance. The local municipality helps the waste management system adapt to the additional complexity of **sanitary landfills**, including aligning stakeholders and enforcing standards for design, operation, etc.
Federal/ state agencies	Federal and state agencies develop policy frameworks with minimum requirements for **dumpsite closure and sanitary landfill** implementation.
Public health agencies	Public health agencies develop rules and protocols, e.g., pollution safety thresholds, for **dumpsite closure and sanitary landfill** implementation to protect human health.

RMI Graphic. Source: ISWA, https://www.iswa.org/closing-the-worlds-biggest-dumpsites-task-force/; DW News, https://www.youtube.com/watch?v=cGvWw4fSLvg; WIEGO, https://www.wiego.org/press/press-release-ghana-waste-pickers-say-closure-threatens-survival-and-demand-government/; University of Colorado Environmental Center, https://www.colorado.edu/ecenter/2021/04/15/hidden-damage-landfills

Challenges in other dumpsite-to-landfill transitions reveal mitigation opportunities that Lagos can leverage to ensure a more seamless transition to landfills

Social

Lack of tailored communication, and engagement with stakeholders across the value chain to convey project risk/impact and gather feedback for planning[27]

Social resistance due to waste generators' unwillingness or inability to pay higher fees, displacement/loss of livelihood of informal workers, or siting concerns[28]

Illegal activities at dumpsites, including the control of areas within the dumpsite by nongovernment officials or mafias[29]

Lack of or insufficient behavioural change among key stakeholders, e.g., waste generators and the informal sector[30]

Technical

Limited data to support planning efforts, such as adequately sizing a new landfill to accommodate changing trends in waste generation or diversion[31]

Lack of technical guidance and capacity to inform the safe design and operation of the facility, clarify stakeholder roles, and prevent inefficiency among affected stakeholders[32]

Insufficient infrastructure to handle newly generated waste due to closing dumpsites before alternative arrangements are made[33]

Lack of proper monitoring and control measures at the closed dumpsite and the new sanitary landfill to prevent safety risks

Limited land availability resulting in difficulty finding suitable landfill sites[34]

Political

Lack of regulatory and enforcement oversight to drive progress and policy development and ensure regulatory compliance

Lack of planning ahead of transition to ensure adequate resource capacity, stakeholder alignment, and long-term preparedness

Coordination challenges between national and subnational government bodies, which could stem from a lack of clarity of roles[35]

Lack of regulations with clear technical standards to guide personnel and contain contamination from the landfill facility

Changes in government administration could cause delays due to different political priorities[36]

Corruption resulting in implementation hurdles[37]

Economic

Difficulty securing financing due to non-bankable projects or limited access to affordable financing[38]

Insufficient planning for economic and employment opportunities to reflect the changing waste management system and support the waste economy[39]

High costs due to fluctuations in exchange rates, high import duty, supply chain issues, political disputes, etc.[40]

Poor cost recovery, often due to the inability of waste generators to pay fees, or nondiverse revenue models

Weak end markets for waste-derived, revenue-generating products[41]

Note: Some challenges may apply across multiple phases. To avoid repetition, we listed challenges within the most relevant phase.

Dumpsites-to-sanitary-landfills transition: Key factors to consider

The impacts and challenges of closing dumpsites and implementing sanitary landfills highlight several important planning elements.

Social

Stakeholder mapping

Stakeholder identification and impact assessment

Community readiness

Capacity building to promote behavioural change

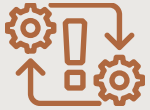
Ability and willingness to pay

Affordability of tipping fees and other service charges

Communication and engagement

Tailored communication and engagement with informal workers

Technical



Environmental impact assessment

Evaluation of environmental impact and development of relevant mitigation plans

Design and operation

Waste acceptance, waste compaction, daily cover, liners, maintaining control systems, etc.

Monitoring and control

Testing, monitoring, and reporting of leachate, landfill gas, and groundwater levels

Technical know-how

Skill and experience to manage daily operation and maintenance

Political

Policy and regulatory frameworks

Robust framework with rules, guidelines, and incentives governing dumpsites and landfills

Resource capacity

Initiatives that enhance capacity building, data collection, policy creation, funding, etc.

Coordination and partnerships

Coordination between government agencies, international partners, and community groups

Enforcement mechanisms

Effective mechanisms to promote enforcement of standards

Economic

Financing for capital projects

Financing for remediating dumpsites and building sanitary landfills

Cost recovery model

Sustainable business models to support the landfill operations post-construction

End markets

Robust markets for recovered recyclables, organics-derived end products, captured LFG, etc.

Employment opportunities

Job opportunities for informal workers within the formal waste management system

03 Gaps in Existing Policy and Regulatory Frameworks for Waste Disposal in Lagos

A clear regulatory framework for sanitary landfilling would facilitate an efficient and equitable transition and support Lagos' climate goals:

- ✓Lagos State has included the transition of open dumpsites to sanitary landfills in its climate action plan.[42]
- ✓By 2030, Lagos aims to decommission five dumpsites and commission a sanitary landfill that captures LFG as one of its commitments under the LOW-Methane initiative.[43]
- ✓In October 2024, Dr. Muyiwa Gbadegesin, managing director of LAWMA, announced plans to close multiple dumpsites starting in December 2024.[44]

Benefits of an Enabling Regulatory Environment

Attracts investment in solid waste infrastructure, e.g., sanitary landfills, by improving investor confidence

Improves coordination by guiding day-to-day operations and stakeholder alignment

Reduces risks to human and environmental health and safety through laws and enforcement mechanisms

While infrastructure can be built without a regulatory framework, the absence of an enabling policy environment often means a lack of clarity on health and safety requirements, equipment standards, design, and operational guidelines, and more.

This lack of regulation or standardisation can stifle planning, transition, financing, enforcement, and implementation efforts, including the operation of the landfill and other improvements in waste management practices. Further, an enforcement entity is necessary to provide oversight and ensure that rules and standards are implemented as intended.[45]

Both national and subnational agencies and policy frameworks oversee waste disposal practices in Lagos

Lagos' waste disposal is governed at both national and subnational levels. Although national and subnational frameworks can have different audiences, scopes, and levels of specificity, they share broad objectives and reinforce each other.

Roles of national vs. subnational policy frameworks

National

- Direct subnational planning
- Provide enforcement guidelines
- Assign responsibilities to subnational bodies
- Outline minimum requirements for compliance
- Establish broader national targets

Subnational

- Tailor national rules to local context by providing additional specificity
- Outline milestones to support national targets[46]
- Require specific enforcement guidelines
- Outline tangible implementation steps
- Assign responsibility to local bodies

Key national and subnational governing agencies for solid waste disposal in Lagos

Federal Ministry of Environment	Develops policy and regulation on environmental protection and resource conservation and fosters partnerships[47]
National Council on Climate Change	Coordinates climate action, policy, implementation, and progress towards Nigeria's climate and emissions targets[48]
National Environmental Standards and Regulations Enforcement Agency	Enforces regulation on sanitation and environmental protection and conducts awareness campaigns[49]
Lagos State House of Assembly	Creates and enacts laws, including those on environmental management, exercises oversight functions, and approves budgets for state government bodies[50]
Lagos State Ministry of the Environment and Water Resources	Develops and implements policies on pollution, oversees state agencies like LAWMA, conducts awareness campaigns, reviews environmental impact assessments (EIAs), and monitors compliance[51]
Lagos Waste Management Authority and Lagos State Environmental Protection Agency	LAWMA manages solid waste and the Lagos State Environmental Protection Agency (LASEPA) manages environmental protection; both agencies create rules and implement programs to promote compliance[52]

Overview of existing solid waste disposal policy and regulatory landscape in Lagos, Nigeria

Policy creation and planning

- Establishes sanitary landfill and dumpsite upgrades as necessary to meet administrative targets
- Establishes plan to convert open dumpsites to sanitary landfills with gas capture and achieve a 20% LFG capture rate by 2050
- Identifies government bodies responsible for developing relevant standards and guidelines, e.g., criteria for annual inspections

Permitting

- Describes disposal activities that require a permit
- Establishes the ability of the State Ministry of Environment to set the conditions for concessional licenses into regulations, including conditions for landfill operational licenses
- Provides general ranges of fines for illegal dumping and grants LASEPA oversight for determining permit fees

Siting

- Lists factors to consider in landfill siting, e.g., zoning laws, proximity to water sources, and if the site requires an EIA
- Restricts developmental activity and sources of pollution around water sources, rivers, schools, residential areas, etc.
- Assigns responsibility to state and local government bodies to identify suitable sites

Design

- Grants oversight to the State Ministry of Environment for approving design plans

Operation

- Prohibits illegal dumping and open burning
- Assigns responsibility to federal and state government bodies to monitor and oversee disposal facility operations
- Requires environmental audits every three years
- Requires landfill owners to provide waste acceptance data to the National Environmental Standards and Regulations Enforcement Agency (NESREA) within a specified timeframe

Closure and post-closure

- Requires compliance with NESREA's conditions for the decommissioning of dumpsites

Monitoring and control

- Requires the protection of ground and surface water
- Requires use of the best-available antipollution technology at waste management facilities
- Establishes the discharge of harmful unfiltered or unpurified gaseous waste as an offense

Finance

- Establishes the responsibility of various government agencies in developing financial incentives and strategies to encourage private sector investment
- Enables the Lagos State Environmental Trust Fund to support landfill operation

For a list of policies covered, please see Appendix C. For more detailed information about specific policies, please see the Annex.

Despite political will in Lagos, the policy and regulatory framework to support the transition to sanitary landfills is lagging

The laws governing waste disposal in Lagos are primarily at the national and state levels. These frameworks provide rules and guidelines on permitting, siting, operations, and pollution control. However, more robust frameworks are needed to add specificity and efficiently advance the implementation of sanitary landfills. Based on the analysis of national and subnational policy for waste disposal sites in four selected countries **Ghana, Brazil, the United States, and Austria** we identified policy gaps and opportunities to create an enabling policy environment for closing dumpsites and implementing sanitary landfills in Lagos. For more information on selected countries and cities, please see Appendix C.

Policy gaps assessment for solid waste disposal in Lagos

Category	Scope of existing policies	Policy gaps
Policy creation and planning	• Establishes sanitary landfill and dumpsite upgrades as necessary to meet administrative targets • Establishes plan to convert open dumpsites to sanitary landfills with gas capture, and to achieve a 20% LFG capture rate by 2050 • Identifies government bodies responsible for developing relevant standards and guidelines, e.g., criteria for annual inspections	**Plans and targets that progress landfill implementation and national goals**, including developing mechanisms to track progress towards targets within policy, outlining relevant requirements of national and subnational waste management plans, e.g., supportive measures for waste pickers, operational standards, corrective action, etc., and developing technical guidelines for landfills, e.g., guidance for siting, operating, and monitoring landfills, and establishing training programs for staff
Permitting	• Describes the disposal activity requiring a permit • Establishes the ability of the State Ministry of Environment to set conditions for concessional licenses, including licenses for landfill operation, into regulation • Names LASEPA in charge of determining permit fees and provides general ranges of fines for illegal dumping	**Specific requirements and components of permit applications**, which include information on hydrogeological and geological features, site investigations/surveys, feasibility and impact assessments, plans for siting, design, operation, closure, post-closure, financial assurance, and more
Siting	• Lists factors to consider in landfill siting, e.g., zoning laws, proximity to water sources, and EIA requirements • Restricts developmental activity and sources of pollution around water sources, rivers, schools, residential areas, etc. • Assigns responsibility to state and local government bodies to identify suitable sites	**Criteria, procedures, and conditions for selecting landfill sites**, e.g., specific distances from residential areas, airports, floodplains, wetlands, and fault areas, site entrance in a low-traffic area, requirements to conduct walkover surveys, and feasibility studies on economic, technical, social, and political elements as part of the permit approval
Design	• Confers authority to the State Ministry of Environment to approve design plans	**Guidelines and technical specifications for landfill design**, e.g., dimensions of roads and the landfill body, requirements for fencing, gas venting, leachate drainage, slope stability, and other essential components of sanitary landfill design

Policy gaps assessment for solid waste disposal in Lagos (continued)

Category	Scope of existing policies	Policy gaps
Operation	• Prohibits open burning and unsanitary disposal • Assigns responsibility to federal and state government agencies to monitor and oversee the operation of disposal facilities • Requires environmental audits every three years • Requires landfill owners to provide waste acceptance data within a specified timeframe to NESREA	**Robust requirements for operational plans and procedures**, including those for waste acceptance, inspections, landfill access, waste deposition and compaction, leachate and gas control systems, fire incidents, monitoring and recording data, health and safety, and equipment maintenance
Closure and post-closure	• Requires compliance with NESREA's conditions for the decommissioning of dumpsites	**Requirements and procedural guidelines on landfill closure and aftercare**, including closure plans, timelines for closure and post-closure activities, restrictions on site end use, criteria for cover material, monitoring of leachate and landfill gas, and site inspections
Monitoring and control	• Requires the protection of ground and surface water quality • Requires the use of the best-available antipollution technology at waste management facilities • Classifies the discharge of harmful, unfiltered, or unpurified gaseous waste as a violation	**Requirements to protect and monitor groundwater** through landfill design, e.g., requirements around permeability and thickness of the landfill mineral layer and landfill liners, depth of wells, as well as operational activities, e.g., guidelines on the use of underground cavities and wells, preventing the infiltration of waste into soil, collecting and treating leachate, adequate sampling and analysis procedures for water quality at and around the site and corrective action measures **Requirements to minimise and monitor landfill emissions**, including setting landfill emissions reduction targets, standards for LFG treatment, restrictions on the landfilling of organic waste, and guidance on emissions accounting, monitoring, and control of landfill emissions, e.g., methodology, sampling frequency, and reporting mechanisms
Finance	• Establishes the responsibility of various government bodies in developing financial incentives and strategies to encourage private-sector investment • Enables the Lagos State Environmental Trust Fund to finance landfill operation	**Requirements to promote landfill cost recovery**, including defining eligibility criteria for financial assistance programs, developing incentives to reduce waste generation, e.g., a landfill tax or volume-based tipping fees, and keeping detailed, updated cost estimates that provide financial coverage through the aftercare period

04

Recommendations and Conclusion

Policy recommendations for closing dumpsites

Recommendations are informed by the policy gaps assessment and challenges faced in other dumpsite-to-landfill transitions.

Category	Recommendations	Key stakeholders
Planning	1. **Requirements for an informal worker transition plan** that is co-developed with informal worker associations, seeks to formally integrate the informal sector into the waste management system, and provides informal workers with social, physical, and economic protections against risk resulting from dumpsite closure 2. **Requirements of personnel transition plans** to move relevant personnel to new roles within the changing waste disposal system and ensure proper maintenance of the closed dumpsite 3. **Requirements for a closure plan** that includes methodology, timelines, and certification of closure activity 4. **Requirements for a post-closure plan** that is certified by a professional engineer or approved by the state	1. LAWMA 2. LAWMA 3. LAWMA, Lagos State Ministry of the Environment and Water Resources (Lagos MOE & WR) 4. LAWMA, Lagos MOE & WR
Permitting and compliance	1. **Standards and guidelines on how and when a dumpsite must be closed**, such as those for closure design, e.g., final cover, material thickness/type of liners to prevent groundwater contamination, pollution concentration thresholds, and other permit conditions 2. **Effective fines and penalties for noncompliance** with defined standards and guidelines to prevent repeat offenses	1. LAWMA, Lagos MOE & WR, LASEPA 2. Lagos MOE & WR
Siting	1. **Standards and guidance for site evaluation and testing** to determine the most appropriate closure method, e.g., closure by removing existing waste, using sanitary cells, using a final cover, and rehabilitating the site, etc.	1. LAWMA, Lagos MOE & WR
Design	1. **Requirements for proper closure design**, including using a final cover that minimises infiltration and erosion, utilizing a leachate collection system, and allowing only authorised personnel access to the site	1. LAWMA, Lagos MOE & WR, Lagos State Ministry of Works and Infrastructure, Lagos State Ministry of Physical Planning and Urban Development
Operations	1. **Requirements for dumpsite closure**, including implementing the chosen closure method, final cover, and LFG and leachate collection systems 2. **Requirements for post-closure maintenance**, including the final cover, leachate collection system, groundwater wells, and the LFG system that is conducted for a stipulated period until pollution levels meet defined safety standards 3. **Guidelines for rehabilitation** and establishing end use of land that benefits the community and economy	1. LAWMA 2. LAWMA, Lagos MOE & WR, LASEPA 3. LAWMA, Lagos MOE & WR, Lagos State Ministry of Physical Planning and Urban Development
Monitoring and reporting	1. **Requirements to comply with pollution thresholds** such as for groundwater and surface/fugitive emissions, e.g., methane, volatile organic compounds (VOCs), CO_2, polycyclic aromatic hydrocarbons (PAHs), and heavy metals 2. **Procedural standards and guidelines for testing, reporting, and corrective action**, e.g., identifying the frequency of checking data reports and evaluating corrective action measures	1. LASEPA 2. LASEPA
Financial sustainability	1. **Requirements to align waste disposal costs with the waste hierarchy**, including using financial mechanisms like fines, taxes, and fees, coupled with strong enforcement, to make open dumping/ burning the most expensive option for disposal 2. **Requirements for receiving financial assistance/subsidy from the state and/or federal government**, such as developing municipal solid waste management plans and projects or using cleaner technology	1. LAWMA 2. LAWMA, Lagos State Ministry of Economic Planning and Budget (MEPB)

Policy recommendations for implementing sanitary landfills

Category	Recommendations	Key stakeholders
Planning	1. **Requirements for a landfill design plan**, including material and dimensions of the landfill, long-term expansion plans that align with city planning, and design of gas/leachate collection and control systems, such as the depth of waste, expandability of the gas collection system, and corrosion resistance[53] 2. **Requirements for a landfill operational plan**, including waste acceptance, deposition, compaction, and equipment maintenance procedures 3. **Requirements for a community engagement plan** that is co-developed with the community to address concerns and potential risks of the nearby landfill, such as loss of business/livelihood and threats to human and environmental health 4. **Requirements for a contingency plan** that details operational procedures during disaster scenarios to ensure human and environmental safety 5. **Requirements for staff safety and certification training** to reduce human error at the landfill 6. **Targets for waste reduction, waste diversion/recovery, and emissions reduction from waste disposal sites** that are aligned with national/subnational targets and can be paired with mechanisms for evaluating progress towards targets 7. **Mechanisms to recover recyclable waste** from landfills through regulation promoting waste treatment initiatives and setting stricter standards for waste acceptance at landfills	1. LAWMA, Lagos MOE & WR 2. LAWMA 3. LAWMA, Lagos MOE & WR, Lagos State Office of Political, Legislative and Civic Engagement 4. LAWMA, Lagos State Safety Commission (LASG Safety), Lagos MOE & WR 5. LASG Safety, Lagos MOE & WR 6. LAWMA 7. LAWMA
Permitting and compliance	1. **Requirements for obtaining permits** for siting, constructing, and operating a sanitary landfill and demonstrating financial assurance/ security 2. **Requirements and standards for approving landfill design, operation, closure, and post-closure plans,** e.g., demonstrating compliance with landfill/other relevant regulations, certification by licensed professionals, the inclusion of required data, and outlining accident protection measures 3. **Requirements to ensure permit compliance** through training programs and penalties and fines along with other enforcement mechanisms	1. Lagos MOE & WR 2. LAWMA, Lagos MOE & WR 3. LAWMA, Lagos MOE & WR
Siting	1. **Requirements for siting**, including feasibility studies, EIAs, and specific distance and directional (not upwind of residential areas) requirements related to vulnerable ecological sites, residential areas, airports, flood zones, fault lines, etc.	1. Lagos MOE & WR, Lagos State Ministry of Physical Planning and Urban Development, Office of the [Lagos] State Surveyor General (OSSG)
Design	1. **Requirements for the design of the landfill components** such as the cell, landfill cover, gas collection and control systems (GCCS), leachate collection systems, and treatment facilities, including the dimensions and material composition of each layer of the cells, run-on and runoff control systems, gas collection wells, the piping network, and barrier walls to prevent gas migration[54] 2. **Requirements for site design**, including standards for fencing, road access, and the placement of buildings	1. LAWMA 2. LAWMA

Policy recommendations for implementing sanitary landfills (continued)

Category	Recommendations	Key stakeholders
Operations	1. **Requirements for day-to-day landfill operation**, including waste acceptance protocols, staff safety and training, managing activity at the working face (e.g., deposition and compaction of waste and daily cover), managing risks like fire and slope instability, maintaining leachate and gas collection systems, monitoring and recordkeeping of landfill operations, such as through use of a data management system 2. **Requirements around the use and/or destruction of captured LFG**, such as for energy generation and flaring 3. **Requirements for proper landfill closure**, such as implementing the chosen closure method and installing a final cover 4. **Requirements for post-closure operation**, including maintaining the final cover, leachate collection system, groundwater monitoring wells, and LFG systems for a stipulated period until pollution levels meet defined standards for safety and any necessary remedial actions are completed	1. LAWMA 2. LAWMA, Lagos State Ministry of Energy and Mineral Resources, Lagos MOE & WR 3. LAWMA, Lagos MOE & WR 4. LAWMA, Lagos MOE & WR, LASEPA
Monitoring and reporting	1. **Requirements to comply with pollution thresholds** such as for groundwater and surface/fugitive emissions (e.g., methane, VOCs, CO_2, PAHs, and heavy metals) 2. **Procedural standards for monitoring**, such as equipment types, frequency of testing, methods of reporting and verification, and data storage 3. **Procedural standards and guidelines for corrective action**, including observing the impact of the pollution event, evaluating the options for corrective action, and implementing suitable corrective measures to reduce environmental and human health risks	1. LASEPA 2. LASEPA 3. LAWMA, LASEPA, Lagos MOE & WR
Financial sustainability	1. **Requirements for detailed cost estimates from landfill operators** that must be updated throughout the life of the landfill through the aftercare period (e.g., capex and opex funds) and could be used as a basis for demonstrating financial assurance 2. **Mechanisms to enhance service fee collection**, such as different tariff structures or pay-as-you-throw models 3. **Incentives to increase private sector investment** in waste diversion projects and resource recovery markets (e.g., recycling markets, biogas markets, and using LFG for energy generation), such as tax credits, subsidies, low-interest loans, and weighted user fees 4. **Incentives to promote employment opportunities for informal workers** to transition them into formal roles within the waste management system and boost recycling rates and the waste economy 5. **Requirements for eligibility for financial assistance** to support the development and operation of the landfill	1. LAWMA 2. LAWMA 3. LAWMA, Lagos MOE & WR 4. LAWMA 5. LAWMA, Lagos MOE & WR, MEPB

These policy recommendations are grounded in real-world case studies

Laws protecting informal workers promote resource recovery and reduce costs in Bogotá, Colombia

In 2011, after protests from the Cooperative Association of Recyclers of Bogotá (ARB), an association for waste pickers, the Constitutional Court passed Order 275 to protect the right to work for waste pickers in Colombia. This required the district government to develop a waste picker inclusion plan and a tariff to support waste pickers in recovering recyclables and organic waste at the source. ARB was also asked by the court to develop a proposal for this tariff. This approach increased focus on waste diversion, extending the life of the Doña Juana landfill, reducing pollution, and increasing resource recovery. This reduced raw material needs in manufacturing and enabled significant cost savings, resulting in decreased end-user fees.[55] Overall, informal worker inclusion decreased waste management costs by 11%.[56]

Incentives to divert waste, extend landfill lifespan, and reduce emissions in Surabaya, Indonesia

The Surabaya Smart City program was created to increase community engagement in waste diversion. This program runs an annual competition assessing practices like source segregation, recycling, composting, waste bank operation, and neighborhood cleanliness. In each round, participants are required to undertake training by nongovernmental organizations (NGOs) to promote awareness of solid waste management practices. Prizes include cash and composting equipment. NGOs help communities obtain resources and run waste banks. In the early stages, the government provided bins and education on the Takakura composting method. From 2005 to 2010, household composting decreased the landfilling of organic waste by 30%, resulting in a reduction of 3,421 tonnes of CO_2e. The program overall continues to divert 10% of waste from landfills every year and has boosted the waste economy, for example, by increasing income streams in low-income communities.[57]

Captured LFG helps power the electricity grid in São Paulo, Brazil

São Paulo is the largest city in Brazil and generates about 13,608 tonnes of waste/per day, similar to the daily waste generation in Lagos. The São João Landfill has long produced large amounts of landfill gas, which was previously passively vented. However, since 2008, LFG has been captured and combusted to generate electricity. The plant has an electricity production capacity of 22.4 megawatts, which is enough to meet the residential electricity needs for approximately 29,866 households, assuming a household size of five members. Between 2007 and 2010, the project reduced emissions by more than 3 million tonnes of CO_2e.[58]

Good recordkeeping and data practices inform groundwater monitoring and pollution control efforts at landfill site

At an active landfill site, groundwater sampling revealed elevated levels of leachate indicators, e.g., sodium, chloride, and ammonia. As this result could indicate a leak, conducting more extensive sampling of affected areas is necessary to inform corrective action. To pinpoint where greater monitoring efforts should focus, SCS Engineers — an environmental consultant hired by the facility — uncovered leachate migration patterns by comparing the sampling results to background levels documented in the site's data records to narrow down areas with elevated levels of pollutants. By leveraging the site's historical data to pinpoint areas of concern, landfill operators can avoid unnecessary costs and labor associated with monitoring the entire site while ensuring the facility remains compliant with pollution thresholds.[59]

Conclusion

The global increase in solid waste generation is creating significant challenges for municipal waste management systems worldwide. This is especially the case where dumpsites with limited environmental controls cause pollutants like heavy metals, PFAS, carbon dioxide, and methane gas to be released into the environment. Exposure to these pollutants has serious consequences for human and environmental health as well as climate impacts.

In 2024, Lagos announced plans to close its dumpsites and transition them to sanitary landfills, which aligns with its Climate Action Plan (2021) and Nigeria's National Roadmap on Solid Waste Management (2022) for better waste disposal practices and emissions reductions.

Transitioning from dumpsites to landfills poses numerous challenges, often exacerbated or caused by the absence of a comprehensive policy framework needed to align and support key stakeholders, project implementation, and the overall waste management system.

This report analyses the regulatory and policy barriers that could hinder the Lagos State government from achieving its goal of upgrading dumpsites to sanitary landfills. It outlines the associated challenges and identifies policy gaps by comparing the national and subnational policy landscape in Lagos with those in four other countries (see Appendix C for information on selected countries and cities). Furthermore, it recommends implementing specific policies that enable effective dumpsite closure and sanitary landfill implementation. These recommendations, although tailored to Lagos, also apply broadly to other states in Nigeria. Through case studies, we illustrate how these policies can enhance a sustainable waste management system in Lagos and allow other environmental and economic benefits.

For effective planning, this analysis highlights the following key takeaways:

1. **This transition will advance Lagos' waste management targets and climate goals and has government buy-in.**
2. **Such transitions are lengthy and necessitate sustained effort.**
3. **This transition requires effective alignment and management of key stakeholders.**
4. **This transition requires robust and enabling policy frameworks to facilitate implementation and this analysis offers key policy recommendations that address various aspects of the transition.**

This transition offers a significant opportunity to mitigate the near-term effects of climate change and improve local health. By adopting an integrated waste management approach in its planning and implementation, this transition can be made more effective and equitable.

We hope this analysis guides decision makers in Lagos in developing a comprehensive policy and regulatory framework to close dumpsites, implement new sanitary landfills, and protect human and environmental health.

Appendices

Appendix A. Harms caused by dumpsites

Dumpsites have negative impacts on human and environmental health

When waste is disposed of at dumpsites, which typically lack environmental controls, toxins contaminate the environment and harm those who depend on it. Beyond health impacts, improper waste management is a major driver of climate change. When untreated organic waste decomposes anaerobically at disposal sites, it generates landfill gas, which can escape from dumpsites without a gas capture system, releasing greenhouse gases (primarily methane and CO_2).

Environmental impacts

- Toxins leak into the soil, ground and surface water, and air, leading to:
  - Increase in heavy metals in water and crops[60]
  - Bioaccumulation of chemicals like PFAS in water sources[61]
  - Air pollution from uncontrolled release of toxic gas and open burning
  - A buildup of microplastics and subsequent degradation in the quality of water and soil[62]
  - Contamination from biological, medical, and unregulated hazardous waste[63]
  - Environmental degradation and air pollution from the release of LFG, including methane, CO2, and other harmful trace gases such as hydrogen sulphide and volatile organic compounds[64]
- Increase in vermin and other pests
- Risk of fire
- Harm to wildlife from the ingestion of toxins when feeding on waste at disposal sites or from getting entangled in garbage[65]

Human impacts

- Contamination of crops with heavy metals and toxic chemicals[66]
- Increase in respiratory illnesses from air pollution.
- Increase in cases of skin irritation, asthma, cholera, malaria, and diarrhea from exposure to waste[67]
- Increase in developmental, neurological, and reproductive issues due to chemicals, such as endocrine disruptors, in plastics[68]
- Spread of infectious disease due to pests and improper disposal of health care waste[69]
- Risk of injuries at disposal sites due to slides and collapse, fire, or explosions.
- Odour from disposal sites.
- Social inequity affecting informal recycling sectors[70]

Appendix B. Challenge spotlights

Challenge spotlight: Lack of informal worker inclusion

Waste pickers are active and essential in maintaining waste management services; they are likely to be disproportionally affected during the transition from dumpsites to sanitary landfills. Inadequate consideration and planning to address their concerns have been shown to result in serious long-term consequences.

Overview of waste pickers' concerns

Displacement	Removal from place of residence and loss of proximity to recyclables
Loss of livelihood	Decreasing access to recyclables, lower income, loss of autonomous business model
Social marginalisation	Lack of dignity, recognition, respect, and inclusion
Health and safety	Harsher working conditions, including harassment and stigmatisation and lack of flexibility

Case study: Stung Meanchey dumpsite closure in Phnom Penh, Cambodia

The Stung Meanchey dumpsite was closed in 2009, replaced by the Dangkor Landfill nearby. This process led to significant protests by informal workers and waste picker organisations due to a lack of strategic planning to include them in the new waste management system. They demanded inclusion and continued access to recyclables with very limited success. Waste pickers whose livelihood depended on the closed dumpsite moved to the Dangkor landfill to continue waste picking. Despite being banned from entering the landfill, they bypassed official barriers or entered through side paths to collect recyclables, which would then be sold to junk shops, to continue making a living. This situation persists today, limiting improvements of the local waste management system.[71]

Consequences observed due to lack of inclusion

Continued waste picking

Disrupt waste management services and pose safety risks

Protests and social tensions

May result in lower recovery rate of recyclables and hinder improvements in waste management

Informal worker inclusion success story: Estrutural dumpsite closure in Brazil

This transition process presents a unique opportunity for the inclusion of the informal recycling sector into the formal waste management system. A transition plan that includes concrete policies and actionable strategies that promote waste picker inclusion is key to enabling an equitable transition. The Estrutural dumpsite success story includes several factors that demonstrate intentional inclusion and considerations grounded in environmental justice principles.

Environmental justice principles for the waste sector

- ✓ **Respect planetary boundaries to ensure intergenerational equity**
- ✓ **Respect for all waste pickers and waste workers**
- ✓ **Enhance inclusion and build from local knowledge**
- ✓ **Respond to pollution and environmental harm with accountability**
- ✓ **Support holistic solutions through systems change**

Source: C40, https://www.c40knowledgehub.org/s/article/How-we-closed-the-second-largest-dumpsite-in-the-world?language=en_US; GAIA, https://www.no-burn.org/wp-content/uploads/2024/09/Environmental-Justice-Principles.pdf

Key factors of success

Regular consultations with informal sector

In the closure process, over 100 conversations occurred between the government and representatives of waste pickers working at the dumpsite to discuss needs and difficulties, benefit of transition, and co-design plans for inclusion and formalisation.

Legal recognition of worker rights and protections

Brazil's National Policy on Solid Waste encourages inclusion of waste picker cooperatives and associations in municipal waste management programs. Recognition in the formal economy gives them access to labor rights, social security, and other legal protections.

Formalising informal sector integration through service contracts

Many waste pickers affected by the closure were employed by the government for waste collection and sorting roles, leveraging their experience in identifying and managing materials in the local waste stream. The government also facilitated their contracting with the private sector.

Providing training programs to upskill informal workers

The government contracted with multiple institutions to offer specific training (e.g., software literacy) to equip waste pickers with skills to meet contractual requirements of Urban Cleaning Services (SLU) and provide extended support as they adapt to their new work environment.

Implementing proper monitoring of contractual activities

To ensure quality of work during the transition, the board of SLU regularly visited sites to provide supervision and reinforce the formality of contractual activities at the beginning until workers were able to self-monitor.

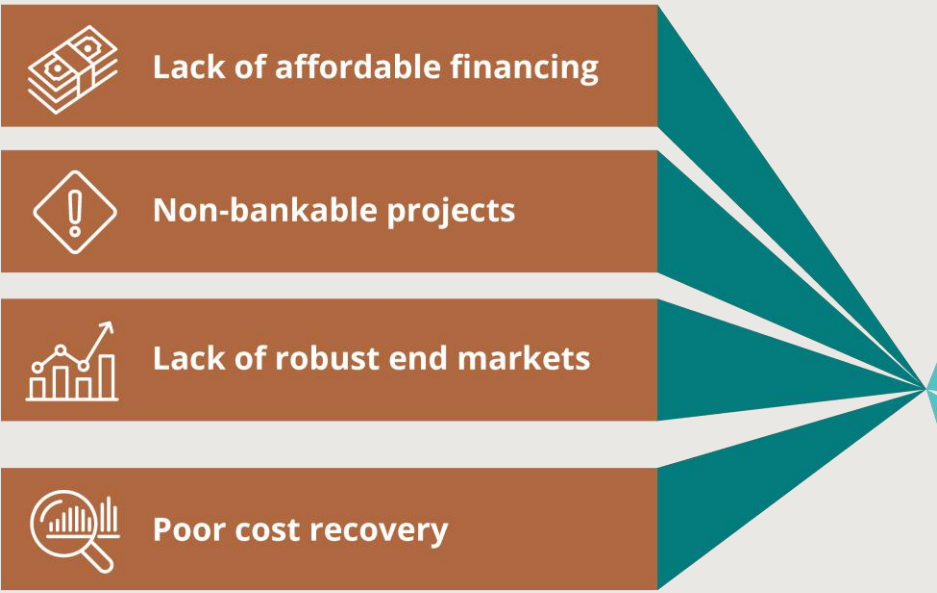
Recognising informal sector inclusion as a long-term process

Conversations between waste pickers and the government on the dumpsite closure started in 2014. After the successful closure in 2018, support for waste pickers to ensure their full integration into the formal economy continued and is still ongoing.

Challenge spotlight: Poor financial sustainability

Sanitary landfills increase the cost of waste disposal. Thus, a diverse financing and cost recovery model is needed to address financial sustainability challenges and their underlying drivers. Policy and legal instruments can help mitigate this challenge.

Drivers of poor financial sustainability



Case study: Improving operational cost recovery for landfills in Mar del Plata, Argentina

Due to a lack of standardised methodology for cost accounting, municipalities in Argentina are often unaware of the full solid waste management costs and were underbudgeting for solid waste management services. To improve cost recovery, the Secretariat of Environmental and Sustainable Development of Argentina developed the Integrated Urban Solid Waste Management Economic and Financial Matrix to help municipalities identify cost gaps and develop procedures to minimise them. Municipal officials received training on how to use the tool to estimate the real costs of waste management investments. This in turn allowed them to appropriately adjust user fees and develop suitable cost recovery models.

Using the tool, the municipality of Mar del Plata developed a tiered fee structure that considers income and wealth disparities among different neighbourhoods. To promote implementation, the municipality conducted extensive community engagement and outreach. Using this structure, Mar del Plata could cover both the variable costs of its waste management system and the operational costs of its landfill.[72]

Policy-based mitigation measures

Incentivise investment by lowering perceived investment risk

- Develop financial incentives to attract private sector investment and stimulate demand for end markets
- Implement robust standards for landfill design, operation, and closure
- Develop policies to enhance local institutional capacity
- Provide guidance for setting tariffs

Develop standards and procedures to minimise operational cost gaps

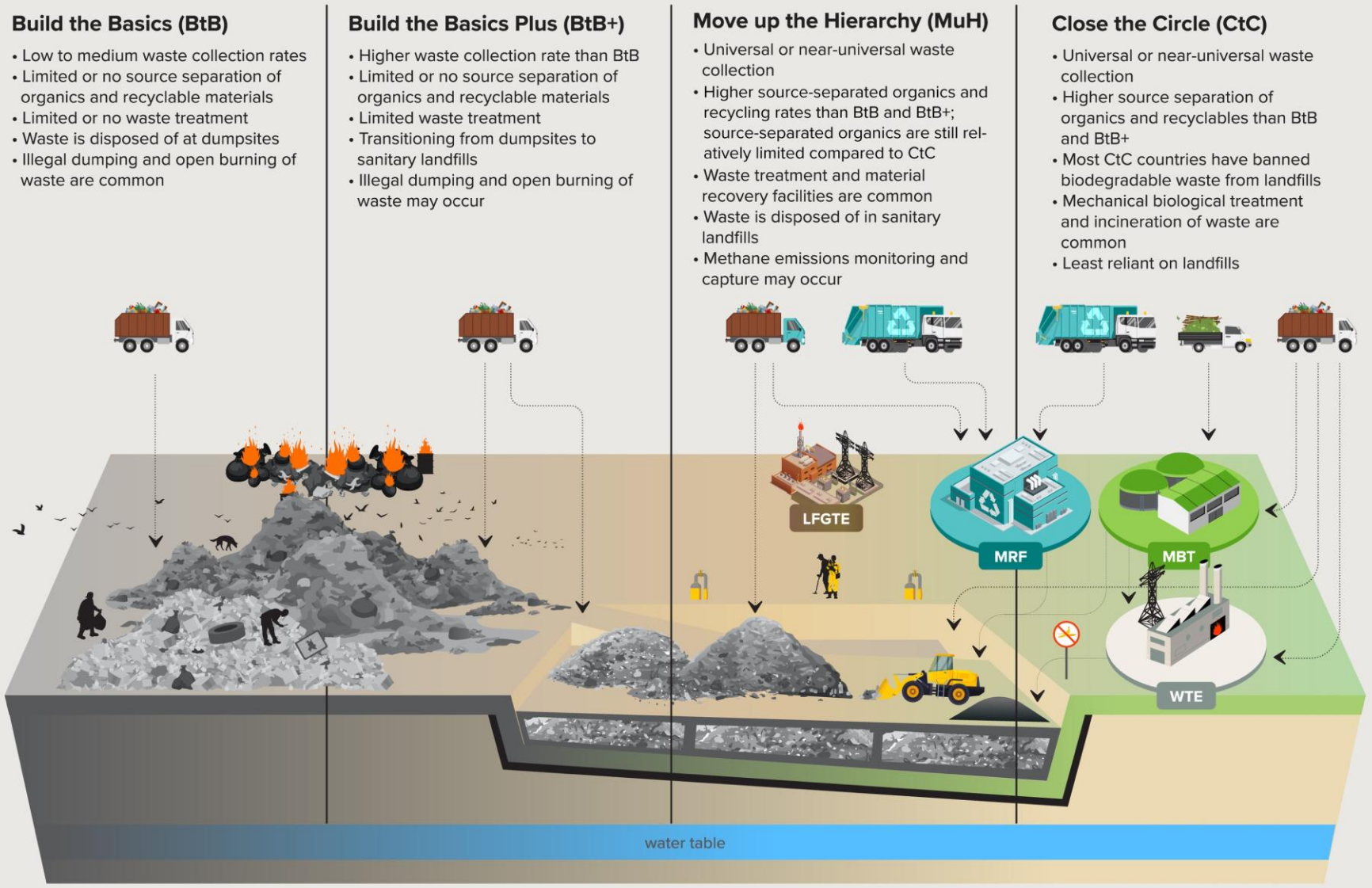
- Set targets and milestones that enable a transition pace that suits the local context and minimises the cost of errors
- Develop guidelines for various payment structures, like weighted user- and volume-based tipping fees
- Set standards for detailed, life-cycle cost accounting practices at landfills

Appendix C. Summary of policy research

Understanding Lagos through the global waste management archetypes

Waste management practices vary significantly across the globe due to factors including economic development, regulatory framework, land availability, and cultural norms. These global management practices are characterised by four main archetypes: **Build the Basics (BtB), Build the Basics Plus (BtB+), Move up the Hierarchy (MuH), and Close the Circle (CtC).**[73]
Lagos, and Nigeria more broadly, are characterised by the BtB archetype, where there is minimal waste diversion and waste is typically disposed of at dumpsites that have no environmental controls. While some regulatory frameworks exist, enforcement is generally weak.[74]

This archetype framework provides a foundation for analysing how countries characterised by relatively more-advanced archetypes have strengthened their waste management systems.



Waste collection, treatment, and disposal activities occur at different sites. Please note that the primary outputs from the MRF and MBT plant (e.g., plastics and biogas) are not depicted. The graphic has been simplified for illustrative purposes.

RMI Graphic. Source: RMI, https://rmi.org/wp-content/uploads/dlm_uploads/2024/03/wastemap_global_strategy_playbook.pdf

Country selection considerations for policy gap assessment

This analysis examines waste disposal policies in four countries with sanitary landfills and compares these policies to those in Lagos to identify policy gaps. The selected countries represent the four waste management archetypes and are at different stages of the sanitary landfill technology adoption. Analysing these frameworks can provide Lagos with valuable insights into how to effectively plan and implement its own transition. Aside from the archetypes, other criteria were also considered.

Country selection considerations

- **Provide informative case studies**
- **Degree of sanitary landfill implementation correlates with the robustness of policy framework**
- **Social, political, and geographical similarities**
- **Representation of a solid waste management archetype in the global playbook**

Country selected per archetype

BtB

Ghana: Both Accra and Lagos are densely populated economic and cultural hubs located on the coast of West Africa. The similarity in geography and waste management archetypes makes Ghana's legal framework important to consider in the analysis.

BtB+

Brazil: Rio de Janeiro and Lagos are both coastal states. Brazil has been developing policy and technical standards to guide the design and operation of landfills. Further, its particular emphasis on supporting informal workers can provide valuable insights.

MuH

United States: The United States has comprehensive landfill regulations, which demonstrate how subnational governments tailor national law to local objectives through specific parameters, detailed permit requirements and local assistance programs, which can inform policy in Lagos.

CtC

Austria: Austria's advanced waste management system and regulatory framework demonstrate how waste disposal policies can promote an integrated waste management system. This framework demonstrates transparency, efficiency and a long-term vision for Lagos.

Stage of sanitary landfill implementation

While **dumpsites are still the primary method of waste disposal**, Ghana began transitioning to sanitary landfills in the early 2000s, with greater efforts in recent years.[75]

Currently, while dumpsites are still in use or being transitioned, **sanitary landfills are used more than dumpsites for waste disposal**. Brazil began transitioning to sanitary landfills in the 1970s.[76]

Sanitary landfills are the primary method of waste disposal, with the U.S. Environmental Protection Agency (EPA) looking to tighten standards for LFG management. Open dumpsites were banned in 1976.[77]

Austria prioritises waste diversion to minimise landfilling of recoverable resources. It prohibits landfilling waste above 5% total organic carbon without pretreatment. Dumpsites have been banned since its 1996 Landfill Ordinance.[78]

Overview of existing solid waste disposal policy and regulatory landscape in Accra, Ghana

Policy creation and planning

- States that enforcement guidelines for siting and managing landfills should be established
- Establishes that policy offering waste disposal guidelines and a system for monitoring compliance with environmental should be developed

Permitting

- Requires a permit to construct and operate a landfill
- Describes landfill permit application components, e.g., certified design document and demonstration of financial security
- Outlines requirements and processes for approving, setting term limits, renewing, and suspending permits.

Siting

- Outlines conditions, procedures, and criteria for selecting landfill sites, e.g., projecting waste generation and disposal needs, stakeholder consultation, composing a committee to conduct community engagement, site investigation, a feasibility report, and an environmental impact statement

Design

- Outlines requirements and guidelines for aspects of landfill design, e.g., liners, containment barrier dimensions, road access, site facilities, gas vents, and fencing
- Provides design guidelines for dumpsite to sanitary landfill upgrades
- Requires facilities to meet health and safety standards for staff, e.g., first aid

Operation

- Outlines criteria for the components of the operational plan, e.g. staff equipment, emergency response, and alternative practices
- Outlines criteria for operational procedures at the landfill, e.g., waste acceptance, deposition and compacting, leachate and gas control, data collection, maintenance of monitoring systems, staff safety, managing waste pickers at the site, etc.

Closure and post-closure

- Outlines requirements for elements of closure plans e.g., submission timeline, final cap and cover design, and leachate management
- Outlines required procedure for closure e.g., providing notice, inspections, and site history to provide in future sale of land
- Discusses guidelines for planning site restoration and end use

Monitoring and control

- Requires quarterly testing of leachate for various parameters, e.g., pH and temperature
- Requires biannual testing of groundwater and surface water at sites specified by the EPA
- Requires gas monitoring positions to be reviewed quarterly and adjusted if needed
- Requires that records should be available to officials by request

Finance

- Assigns responsibility to the EPA to ensure producers pay for the environmentally sound disposal of products deposited in collection facilities
- Assigns responsibility of charging volume or weight-based tipping fees that vary by waste type to the Accra Metropolitan Assembly

For more detailed information about specific policies, please see the Annex.

Overview of existing solid waste disposal policy and regulatory landscape in Rio de Janeiro, Brazil

Policy creation and planning

- Describes topics to be covered in national, state, and MSW management plans, e.g., operational standards, corrective action, targets for LFG use, and programs to support waste pickers
- Calls for municipalities to identify any disposal activity that requires a state license

Permitting

- Describes activities and locations that require a license for waste disposal, e.g., owning/operating a landfill, providing health services, operating airports and ports
- Establishes requirements and guidelines for obtaining landfill operational licenses, e.g., EIAs, public consultation, etc.
- Outlines various offenses, fines, and penalties for noncompliance

Siting

- Outlines requirements and standards for siting landfills, e.g., maximising public acceptance, avoiding 100-year flood plains, etc.
- Provides considerations for site evaluation, e.g., topography, soil permeability, slope, etc.

Design

- Outlines standards for components of landfill design, e.g., fencing, buffer zones, surface water diversion systems, leak detection, groundwater monitoring, and liner systems
- Makes accommodations for alternative plans that may be needed to ensure economic feasibility and to meet legal standards

Operation

- Establishes final disposal as the least-preferred waste management option
- Prohibits waste picking and requires collection services to prioritise employing waste pickers
- Requires oversight of landfill operations by a technical manager
- Outlines technical standards for operational elements, e.g., waste acceptance, staff training, maintenance of control systems, and recordkeeping requirements

Closure and post-closure

- Establishes standards for components of closure plans, e.g., methodology, final cover design, timeline, description of waste in place, land end uses, and post-closure groundwater monitoring, maintenance of monitoring and controls, and financial provisions
- Outlines standards for elements of site closure and post-closure, e.g., site access, final cover, groundwater, leachate, and gas monitoring

Monitoring and control

- Outlines standards for groundwater monitoring, e.g., location of wells, considerations for monitoring parameters, basis for sampling procedures and frequency, and monitoring effluent from leachate treatment systems
- Requires the capture and treatment of LFG

Finance

- Encourages the use of financial incentives to promote solid waste management projects
- Requires the development of subnational solid waste management plans for financial assistance and requires these plans to encourage business opportunity
- Assigns oversight of financial credit approval to the National Environmental Council

For more detailed information about specific policies, please see the Annex.

Overview of existing solid waste disposal policy and regulatory landscape in Washington State, US

Policy creation and planning

- Requires state plans to develop operational standards for gas collection and control, and for testing and reporting procedures for methane surface emissions to ensure regulatory compliance
- Requires the establishment of programs to prevent hazardous waste disposal at solid waste landfills by recording inspections and training staff
- Establishes goals to reduce landfilling of organic waste

Permitting

- Requires a permit for landfill construction and operation
- Outlines requirements for permit application components, such as engineering and hydrogeologic reports, monitoring, operation, closure and post-closure plans, and financial assurance
- Establishes the penalty and enforcement procedure for violations of methane thresholds

Siting

- Outlines siting considerations, e.g., distance from airports and flood plains
- Outlines siting restrictions for specific locations/conditions, e.g., wetlands, fault areas, seismic zones, national parks, protected areas, and above sole-source aquifers
- Requires the review of site assessments to ensure compliance with standards

Design

- Outlines requirements for components of landfill design, e.g., parts and mineral makeup of the composite liner, leachate collection system, lateral expansions, and monitoring systems, including the number, spacing, and depth of wells
- Overviews requirements and factors to consider when approving alternative designs and setting relevant points of compliance

Operation

- Outlines requirements for components of landfill operation, e.g., waste acceptance, compaction, run-on-runoff systems, daily cover, inspections, recordkeeping, reporting, supervision, staff training, managing dust/litter, site accessibility, etc.
- Overviews requirements for components of the operational plan, e.g., maintaining leachate and gas collection, managing fires and contaminant release, etc.

Closure and post-closure

- Outlines closure requirements, e.g., minimally permeable final cover, timelines, certification of closure, and transparency in sale of remediated land
- Outlines closure plan requirements, e.g., on-site waste inventory and closure activity schedule
- Outlines requirements for post-closure, e.g., maintenance of final cover and collection systems, monitoring, and 30-year aftercare
- Outlines post-closure plan requirements

Monitoring and control

- Overviews procedural requirements for groundwater monitoring, e.g., compliance schedule, sampling frequency, depth of wells, analytical procedures, detection monitoring, and reporting
- Overviews requirements for GCCS monitoring, e.g., surface emissions monitoring design plan, wellhead monitoring, corrective actions, recordkeeping, and reporting
- Establishes emissions cap of 25,000 tonnes of CO_2e after 2031, unless the landfill complies with landfill methane emissions requirements

Finance

- Details components of financial assurance requirements, e.g., types of financial mechanisms, cost estimates, and discounting
- Outlines eligibility requirements for financial assistance, e.g., forming a solid waste advisory committee and maintaining a local solid waste plan
- Establishes landfill emissions reduction projects as eligible to receive funds from a climate investment account in Washington

For more detailed information about specific policies, please see the Annex.

Overview of existing solid waste disposal policy and regulatory landscape in Vienna, Austria

Policy creation and planning

- Requires national strategies and plans to align with EU targets, goals, and timelines for reducing organic waste disposal in landfills
- Overviews procedures for calculating and documenting progress towards targets

Permitting

- Outlines permit application requirements, e.g., review of hydrogeological and geological features, operation and pollution prevention plans, financial assurance, and impact assessment
- Outlines conditions for permit approval, e.g., proper oversight, and plans for operation, design, monitoring, control measures, and accident prevention

Siting

- Details considerations for landfill siting, e.g., distance from agricultural, residential, and urban areas; geological and hydrogeological conditions; and the risk of natural disasters
- Establishes siting restrictions for ecologically sensitive areas
- Requires the submission of site surveys and investigations for site approval

Design

- Outlines technical criteria for components of landfill design, e.g., slope stability, the basis for landfill subgrades, and collection, storage, and treatment systems for LFG and leachate

Operation

- Overviews waste acceptance requirements and procedures, e.g., prohibits landfilling waste above 5% TOC without pretreatment
- Details requirements for components of operation, e.g., inspections, monitoring procedures, sampling, reporting, minimising hazards like dust and odour, leachate management, staff and equipment safety, additional waste conformity, and characterisation assessments

Closure and post-closure

- Requires supervision of closure by designated authority
- Details procedural requirements of closure, e.g., final on-site inspection and report assessment
- Requires a geological barrier and top liner that prevents the infiltration of water
- Requires operators to monitor leachate and LFG until they no longer pose health risks

Monitoring and control

- Requires continual monitoring, and electronic data records until the end of aftercare
- Details groundwater monitoring requirements for sampling, testing, recordkeeping, and reporting
- Outlines requirements to control the migration/accumulation of LFG (e.g., energy production or flaring) for landfills that receive organic waste
- Outlines emissions reporting requirements

Finance

- Requires waste disposal fees to account for operation, financial assurance, closure, and 30 years of aftercare
- Describes various mechanisms for financing waste disposal, e.g., the landfill tax and the Clean Up Contaminated Sites Act 1989, which funds the remediation of old landfill sites

For more detailed information about specific policies, please see the Annex.

Appendix D. Policy and regulatory frameworks reviewed

Key policies and regulations on solid waste disposal in Nigeria, Ghana, and Brazil

	National frameworks	Subnational frameworks
Lagos, Nigeria	• Policy Guidelines on Solid Waste Management 2005[79] • National Environmental (Sanitation and Wastes Control) Regulations 2009[80] • National Environmental (Surface and Groundwater Quality Control) Regulations, 2011[81] • National Policy on the Environment (Revised 2016)[82] • National Policy on Solid Waste Management, 2020[83] • National Roadmap on Solid Waste Management, 2022*[84]	• Lagos State Environmental Management Law, 2017[85] • Lagos State Climate Action Plan[86]
Accra, Ghana	• Ghana National Environmental Policy[87] • Environmental Assessment Regulations, 1999[88] • Hazardous, Electronic and Other Waste Control and Management Regulations, 2016[89] • Ghana Landfill Guidelines, 2002[90]	• Accra Metropolitan Assembly Sanitation Bye-laws, 2017[91] • Building/ Physical Development) Bye-laws, 2017[92]
Rio de Janeiro, Brazil	• Act No. 6.938 of 31st of August 1981, which established the National Environmental Policy[93] • CONAMA Resolution No. 001, of January 23, 1986[94] • ABNT NBR 13896 of 1997 Non-hazardous Waste Landfills Criteria for Design, Implementation and Operation[95] • Decree N. 6.514, of July 22, 2008[96] • Law No. 12,305, of August 2, 2010, which established the National Solid Waste Policy[97] • Federal Decree No. 10,936/2022, which regulates the National Solid Waste Policy[98] • Law No. 14.026, of July 15, 2020[99] • Decree No. 11.043, of April 13, 2022, which is the National Solid Waste Plan (PNRS)[100] • ABNT NBR 17100-1 of 2023, Waste Management General Requirements[101]	• Rio de Janeiro State Solid Waste Management Policy Law No. 4191, of September 30, 2003[102] • Decree No. 41084, of December 20, 2007, which regulates the State Solid Waste Management Policy[103]

*This document is out of scope of this analysis as it is not a policy or regulation. However, it provides a conceptual guideline to align Nigeria's solid waste management sector to achieve its solid waste management goals and includes a milestone specifically on dumpsite closure.

Appendix D. Policy and regulatory frameworks reviewed

Key policies and regulations on solid waste disposal in the United States, and Austria

	National frameworks	Subnational frameworks
Washington State, United States	• 40 CFR Part 258, part of the Resource Conservation and Recovery Act (RCRA)[104] • 40 CFR Part 60 Subpart Cf, part of the Clean Air Act (CAA)[105] • 40 CFR Part 60 Subpart XXX, part of the Clean Air Act (CAA)[106]	• Chapter 70A.205 RCW Solid Waste Management-Reduction and Recycling[107] • Chapter 70A.540 RCW Landfill Methane Emissions[108] • Chapter 70A. 65 RCW Greenhouse Gas Emissions-Cap and Invest Program[109] • Chapter 173-300 WAC Certification of Operators of Solid Waste Incinerator and Landfill Facilities[110] • Chapter 173-351 WAC Criteria for Municipal Solid Waste Landfills[111] • Chapter 173-312 WAC Local Solid Waste Financial Assistance[112] • Chapter 173-408 WAC Landfill Methane Emissions[113]
Vienna, Austria	• Directive 1999/31/EC on the landfill of waste[114] [Regional framework, EU] • Waste Management Act 2002[115] • Ordinance on Landfills (Landfill Ordinance 2008), Federal Law Gazette II No 39/2008, as amended by Federal Law Gazette II No 291/2016[116] • Clean Up Contaminated Sites Act 1989[117]	• Vienna Waste Management Act[118]

Annex

For detailed policy research, please visit this link.

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