

IMPROVING SOLID WASTE AND PLASTICS MANAGEMENT IN LAGOS STATE: A WAY FORWARD



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ABOUT THIS SERIES

Africa is the second-largest contributor to global ocean plastic pollution, accounting for 7.8 percent of annual plastic inputs from rivers, following Asia. Projections suggest that Africa may become the primary source of mismanaged plastic waste globally by 2060, surpassing Asia.

The objective of this study is to support Nigeria, particularly Lagos State, which is the most populous coastal state in Africa, in its effort to reduce marine plastic pollution by promoting sustainable plastic management. The study targets various stakeholders, including government and private sector actors. It aligns with national and regional strategies, including Nigeria's *National Policy on Solid Waste Management* and *Lagos State Development Plan 2052*. The study aims to benefit the broader Blue Economy by creating economic opportunities, improving environmental sustainability, and supporting job creation in waste management. The following series of publications, aimed at enhancing the knowledge of stakeholders in the region, is a core aspect of this study. The reports, including this one, are:

1. *Improving Solid Waste and Plastics Management in Lagos State: A Way Forward* (This report)
2. *Improving Solid Waste and Plastics Management in Lagos State: An Analysis of the Solid Waste Sector* (Internal report)
3. *Improving Solid Waste and Plastics Management in Lagos State: An Institutional Analysis* (Internal report)
4. *Improving Solid Waste and Plastics Management in Lagos State: Guidance Document on Implementing Extended Producer Responsibility for Plastic Packaging*
5. *Barriers and Solutions for Sustainable Household Waste Management in Lagos, Nigeria*
6. *Improving Solid Waste and Plastics Management in Lagos State: An Economic Analysis* (Internal report)
7. *Improving Solid Waste and Plastics Management in Lagos State: Assessing Air Pollution and Greenhouse Gas Emissions* (Internal report)
8. *Improving Solid Waste and Plastics Management in Lagos State: Assessing Plastic Waste from Healthcare Facilities* (Internal report)
9. *Improving Solid Waste and Plastics Management in Lagos State: Waste Characterization Study at Olusosun Dumpsite in Lagos* (Internal report)
10. *Improving Solid Waste and Plastics Management in Lagos State: Creating a Plastics Recycling Market* (Internal report).



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These reports are targeted at various departments and agencies related to environment and waste management within the Lagos State Government as well as federal ministries in the Government of Nigeria, responsible for environment, health, industry, trade, and investment. Recycling value chain players, including informal collectors, recyclers, and plastics manufacturers and related stakeholders working on marine plastic pollution in the region will also benefit from this report.

This project aligns with the Blue Economy approach by addressing solid waste management and marine plastic pollution, which can have significant economic, social, and environmental costs. It creates opportunities for new value chains, private sector involvement, job creation, and the restoration of coastal and marine ecosystems, all contributing to the growth of the Blue Economy.

The study also aligns with Nigeria's Country Partnership Framework (CPF) 2020-2024, focusing on fostering jobs, economic transformation, and sustainable business growth. It also aligns with the government's national policies on solid waste and plastic waste management, as well as Lagos State's development plans related to sustainable environment and job creation in waste management.

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ABBREVIATIONS

3 R	reduce, reuse, recycle
AEPB	Abuja Environmental Protection Board
AfDB	African Development Bank
ARBR	Alliance for Responsible Battery Recycling
ASA	advisory services and analytics
AWAMN	Association of Waste Managers of Nigeria
BBRI	Blue Box Recycling Initiative
B2B	business to business
CAGR	compound annual growth rate
CAPEX	capital expenditure
CBO	community-based organization
CDM	clean development mechanism
CoED	cost of environmental degradation
CH₄	methane
CLI	Cleaner Lagos Initiative
CRC	community recycling center
CREM	Climate Resilience and Environmental Management
CSR	corporate social responsibility
cu. m	cubic meter
DRS	deposit refund scheme(s)
EA	enumeration area
EBITDA	earnings before interest, taxes, depreciation, and amortization
ECOWAS	Economic Community of West African States
EEE	electrical and electronic equipment
EIA	environmental impact assessment
EPR	extended producer responsibility
EPRON	E-waste Producer Responsibility Organisation Nigeria
EPS	expanded polystyrene
EU	European Union
FBRA	Food and Beverage Recycling Alliance
FCDA	Federal Capital Development Authority

FCDO	Foreign, Commonwealth & Development Office, UK (formerly known as DFID)
FCT	Federal Capital Territory
FEPA	Federal Environmental Protection Agency, Nigeria
FGD	focus group discussion
FMCG	fast-moving consumer goods
FME_{nv}	Federal Ministry of Environment, Nigeria
GDP	gross domestic product
GHG	greenhouse gas
GIVO	Garbage In Value Out
GWP	global warming potential
HCF	healthcare facility
HCW	healthcare waste
HDPE	high density polyethylene
IDI	in-depth interview
IFC	International Finance Corporation
IRR	internal rate of return
KAI	kick against indiscipline
kg	kilogram
KII	key informant interview
KPI	key performance indicator
ktons	kilotons
LASEPA	Lagos State Environmental Protection Agency
LAWMA	Lagos Waste Management Authority
LSDP	Lagos State Development Plan 2052
LDPE	low density polyethylene
LGA	local government area
LGC	local government council
LPD	Lagos Platform for Development
LRI	Lagos Recycle Initiative
LSRDB	Lagos State Refuse Disposal Board
LSWDB	Lagos State Waste Disposal Board
MDA	ministries, departments, and agencies
LS-MoEnv	Lagos State Ministry of Environment

MPW	mismanaged plastic waste
MRF	materials recovery facility
MSMEs	micro, small, and medium enterprises
MSW	municipal solid waste
MSWM	municipal solid waste management
MTSS	Medium-Term Sector Strategies
MT	metric tons
MTCO₂e	metric tons of carbon dioxide equivalent
NAFDAC	National Agency for Food and Drug Administration and Control, Nigeria
NBS	National Bureau of Statistics, Nigeria
NCEP	National Circular Economy Programme, Nigeria
NCEWG	Nigerian Circular Economy Working Group
NDC	nationally determined contribution
NDLEA	National Drug Law Enforcement Agency, Nigeria
NESREA	National Environmental Standards Regulations and Enforcement Agency, Nigeria
NGHS-Panel	Nigerian General Household Survey - Panel
NGO	non-governmental organization
NIMASA	Nigerian Maritime Administration and Safety Agency
NIO	non-intrusive observation
NPSWM	National Policy on Solid Waste Management
NPPWM	National Policy on Plastic Waste Management
NWMC	National Waste Management Council
OPEX	operational expenditure
PASA	programmatic advisory services and analytics
PE	polyethylene
PET	polyethylene terephthalate
PM	particulate matter
PMEH	Pollution Management and Environmental Health
POM	placed-on-market
PP	polypropylene
PPP	public-private partnership

PRO	producer responsibility organization
PS	polystyrene
PSF	polyester stable fiber
PSP	private sector partnership
PVC	polyvinyl chloride
RAN	Recyclers Association of Nigeria
RDF	Refuse-derived fuel
RoI	return-on-investment
rPET	recycled polyethylene terephthalate
SDGs	Sustainable Development Goals
SEPA	state environmental protection agencies
SMEs	small and medium enterprises
SON	Standards Organisation of Nigeria
SUP	single-use plastic
SURGE	Sustainable Urban and Regional Development
SWM	solid waste management
SWMA	solid waste management authorities
TLS	transfer loading station
TPD	(metric) tons per day
TPY	(metric) tons per year
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
VAT	value-added tax
WACA	West Africa Coastal Areas
WHO	World Health Organization

Currency Conversion

Year	Annual Average Exchange Rate
2018	\$1 = ₦306
2019	\$1 = ₦307
2020	\$1 = ₦359
2021	\$1 = ₦399
2022	\$1 = ₦423
2023	\$1 = ₦459

All dollar amounts in this report are in US dollars



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EXECUTIVE SUMMARY

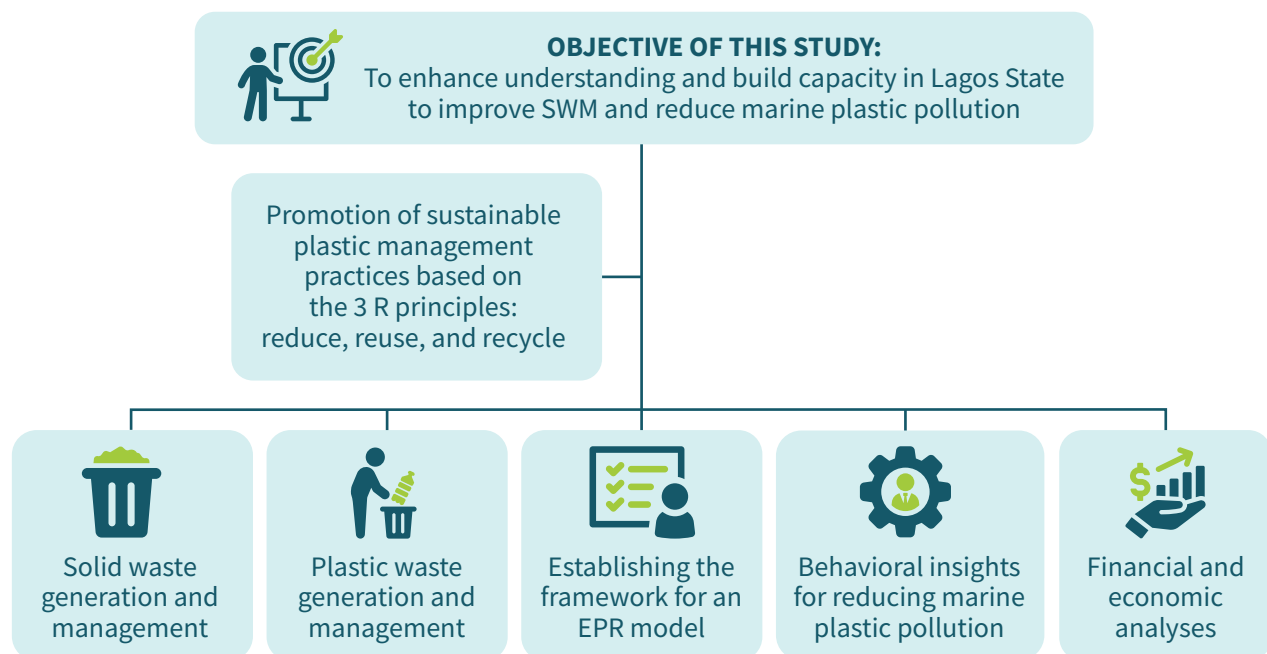


Nigeria, Africa's largest economy and most populous country, faces significant development and environmental challenges despite its economic growth. The country's ability to sustain this growth while achieving its development objectives is crucial for its stability and leadership in Africa. However, Nigeria's current infrastructure struggles to meet the demands of increasing solid waste generation. This issue is particularly acute in Lagos, a coastal megacity with over 24 million residents. Here, drains frequently become clogged with plastic waste, causing recurrent flooding and harming the marine ecosystem. The severity of this problem is evident in the Lagoon area of Lagos State, where vast amounts of plastic waste accumulate along the shoreline.

To combat these detrimental impacts on economic growth, livelihoods, and overall quality of life, the federal and state governments in Nigeria have made solid waste management (SWM) a priority. In this regard, relevant policies have been launched in Nigeria as well as in Lagos. However, policy implementation requires strategic planning, adequate financing, and targeted action, as underscored by the ongoing challenges impeding extended producer responsibility (EPR) and plastic bag prohibition, which remain stalled. Even in Lagos State, the budget allocated to the SWM authority (Lagos Waste Management Authority [LAWMA]) to manage waste is a meager 2 percent of the total, whereas 5 percent is the advised minimum for countries in need of infrastructure improvements.

A well-functioning SWM sector has significant benefits for health, the environment, job creation, inclusive economic growth, and climate risk mitigation. This study, funded by PROBLUE and Sustainable Urban and Regional Development (SURGE), aims to contribute to these overarching goals, by enhancing knowledge and policies to improve SWM, reduce marine plastic pollution, and strengthen the sector in Nigeria. The study has a specific focus on Lagos State and its potential cross-sectoral benefits, particularly because the study has been undertaken as part of the Lagos Platform for Development Programmatic Advisory Services and Analytics project.

Figure ES.1. Objectives of this Study



The objective of this study is to enhance understanding and build capacity in Lagos State to improve SWM and reduce marine plastic pollution by promoting sustainable plastic management practices based on the 3 R principles: reduce, reuse, and recycle. This report comprehensively analyzes the five aspects listed in figure ES.1 for both Lagos State and Nigeria. The executive summary provides further details on each of these aspects. The information presented in these sections is derived from desk research, stakeholder consultations involving both government and private sector actors, as well as household field surveys conducted in Lagos. This report represents a synthesis of the findings from these analyses.

In addition, this work conducted sectoral deep dives, concentrating on the following aspects: (1) Emissions of particulate matter and greenhouse gases from municipal solid waste in Lagos State; (2) Quantification of plastic waste generation in healthcare facilities (HCF) in Lagos State; (3) Waste characterization study at Olusosun dumpsite; (4) Plastic hotspot analysis in Lagos State; and (5) An analysis of business models related to plastic waste recycling. Each aspect has been performed as a stand-alone study, and this report serves as their synthesis. The key findings are provided in topic sheets at the end of this report. This report also provides a roadmap for solid waste and plastic management both in Lagos State and Nigeria.

The waste characterization study conducted at the Olusosun dumpsite yielded surprising results. In contrast to prior investigations that primarily indicated organic waste dominance, this study uncovered that the proportion of plastic waste was equivalent to that of organic waste, comprising food, wood, and green waste. Notably, plastic bags emerged as the predominant subcategory of plastics, accounting for 40 percent of the waste composition, underscoring the concerning inadequacy in their recycling rates. It is also essential to recognize that the actual volume of plastic waste generated may significantly surpass the calculated figure, as a portion of the collected waste may never make it to the dumpsites.

ES.1 Solid Waste Generation and Management in Lagos State: Challenges and Recommendations

Municipal solid waste (MSW) generation, collection, and disposal: The challenges faced by Lagos State in the solid waste and plastic management value chain have been identified as follows: lack of household waste segregation, lack of awareness and knowledge of waste separation, excessive use of plastic for packaging, and gaps in data. Recommendations to address these issues include low-cost alternatives to SUPs, awareness campaigns, provision of separate color-coded wastebins, increase in coverage of MSW services, increase in involvement of the private sector, and incentivizing of aggregators to share data on a central platform to track the quantity of recyclables collected.

Policies and institutional arrangements: The solid waste sector in Lagos State faces several challenges, including insufficient financing, poor enforcement of policies, policy inconsistency, and lack of continuity of policies (that is, accompanying strategies and plans). The legislative and de facto institutional framework for enforcing waste control regulations in Lagos State is inadequate and does not reflect the SWM limitations on the ground. The resources available to the enforcing agencies as well as waste collection coverage by private operators are hard to track. Equity aspects, such as enforcing EPR, are crucial to increase private SWM financing, shifting the burden from the taxpayer to private companies profiting from plastic packaging production, across Nigeria and would have significant impacts in Lagos State once enforced. To address these challenges, the

report recommends the need for stringent and appropriate regulations and standards, guidelines to enhance compliance with existing laws, the introduction of monitoring mechanisms, and engagement with the informal sector as a key stakeholder. The government could clarify the restrictions on informal waste workers, such as a ban on cart pushers and wheelbarrow operators suggested in the Cleaner Lagos Initiative (CLI).

Private sector participation: The study highlights several challenges faced by the private sector in MSW management in Lagos State. Poor service delivery, inadequate funding, lack of competition among private sector participants, insufficient infrastructure and equipment, and lack of transparency are among the main challenges identified. To overcome these challenges, the report recommends the following actions: First, adopt a clearly defined private sector partnership (PSP) model, increase funding from both the government and private sector, and partner with international funding organizations, and follow international good practice, for example, South Africa industry engagement in recycling. In addition, increase household waste collection and source segregation by making it compulsory for every household to install affordable equipment for collection is advised. Further, attract more multinationals into recycling and improving waste management infrastructure by providing more efficient equipment and additional transfer loading stations are advised. Finally, improve transparency by publishing annual accounts, investment and operational plans, and infrastructure and equipment details and justifying tariffs. Recent progressive policies show the state government's commitment to tackling MSW issues such as providing land and guarantees to the private sector (for instance, the Food Beverage Recycling Alliance's proposed plastic waste aggregation hub).

ES.2 Plastic Waste Generation and Management in Lagos: Challenges and Recommendations

Plastic waste collection, treatment, and disposal: The study highlights that plastic waste recycling in Lagos State has already begun, although only a few companies are adding value to plastic waste through pretreatment processes. Challenges faced by waste collectors and recyclers include high investment requirements, access to funding and capacity, and issues related to the quality and price of materials. The report recommends that the government should encourage, and support companies involved in plastic recycling. Companies are also likely to adapt to changes in their business models, such as the use of recyclable materials, if regulations on EPR are imposed.

Policies and institutional arrangements for plastic waste in Lagos State: The Lagos State Ministry of Environment (LS-MoEnv) and LAWMA have developed a plastic waste management policy aligned with the national policy to overcome challenges faced in addressing plastic waste management. However, there are still challenges that need to be addressed, including enforcement, infrastructure, compliance and integration of the informal sector, limited resources, and public awareness.

Policy and institutions for plastic management at national level: Challenges include a lack of national-level policy standardizing the definition of single-use plastics (SUPs), voluntary and rudimentary implementation of EPR schemes, inconsistent efforts to promote behavioral change, and failure to implement important measures such as levies on SUPs and taxes. Additionally, the private sector lacks incentives to invest in sustainable packaging business models. While the *Plastic Bags Prohibition Bill* (2019) represents a trend, it could benefit from including affordable alternatives to plastic bags and market-based instruments.

ES.3 Setting the Framework for an EPR Model for Nigeria

The report recommends the creation of an EPR e-registry as the first step in the implementation roadmap for EPR, which will provide a reliable overview of market players and volumes of plastics being placed on the market. The e-registry will ensure compliance with collection and treatment targets as well as allow oversight by state authorities and other entities such as the National Environmental Standards and Regulations Enforcement Agency (NESREA). The report also provides a set of initial recommendations for the creation of an EPR e-registry for plastics in Nigeria.

ES.4 Behavioral Insights to Reducing Marine Plastic Pollution in Lagos State

The study presents obstacles identified in the main behavioral aspects for sustainable domestic waste management in Lagos, Nigeria: **reduce, reuse, or recycle, and waste disposal**. The analysis follows the COM-B framework introduced by Michie et al. (2005) and Michie, Van Stralen, and West (2011), which is based on the premise that behavior change is influenced by three key components: capability, opportunity, and motivation. Capability refers to an individual's physical and psychological ability to perform an action, for example, the knowledge, awareness, and skills needed to sort waste according to the material effectively. Opportunity encompasses environmental and social factors influencing behavior such as social norms, resource access, and the physical environment. These could include affordability and access to waste management items (for example, waste bin) or the custom or habit of neighbors to dispose of waste in the correct location. The findings reveal several barriers to sustainable domestic waste management along the process leading to its generation and disposal. In the planning and shopping stage, convenience and personal preferences are identified as significant barriers to sustainable practices. At the stage of product transportation, the convenience and prevalence of plastic bags are identified as barriers. The study finds that proper waste disposal options are not readily available to all citizens and social norms further contribute to inadequate disposal, that is, littering is common because “everyone does it,” and many view it as a habitual practice.

ES.5 Financial and Economic Analyses of MSW Management in Nigeria and Lagos State

Adequate financing is essential for SWM, but overreliance on public finance mechanisms and limited private sector participation pose challenges. For example, in the Federal Capital Territory (FCT), only 2.43 percent of the annual budget was allocated for SWM, while this number reaches 20 percent in most low-income countries and 10 percent in most middle-income countries (such as Nigeria). User fees collected from households, enterprises, and institutions are an important source of financing, but they do not cover a meaningful portion of the cost. Nigeria's *National Policy on Plastic Waste Management* (NPPWM) lacks specific funding targets. SWM in Lagos State is mainly financed by annual government allocations and waste collection tariffs.

The Lagos State Government provides guarantees to private companies for loans from commercial banks, and these loans have been used to purchase equipment. The cost of waste management plans is expected to be ₦50 billion from 2022 to 2025, and collaboration between the private sector, banks, and LAWMA is sought. To address road blocks in decision-making at LAWMA and the perceived lack of transparency in its operations, a yearly report published online is advisable. The current

solid and plastic waste management in Lagos city is costly to society because of its environmental consequences. About 13,000 metric tons (MT) of solid waste is generated daily, but only between 30 and 70 percent is collected, and the remaining is disposed of in the environment, resulting in a social cost, at least, of approximately \$218 million per year. As per official data from Lagos Bureau of Statistics in 2020, ‘refuse collection’ is 4,200 tons per day (TPD), a 33 percent collection rate of the estimated 13,000 TPD in the short, medium, and long term.

ES.6 Roadmap Recommendations for Sustainable MSW Management in Nigeria and Lagos State

Immediate investment in municipal solid waste (MSW) management and waste reduction is imperative for Nigeria. This research provides actionable recommendations, forming a roadmap based on assessments and aligned with existing policies. Tables ES.1 and ES.2 offer waste management authorities a practical blueprint to plan and execute their activities. Both tables offer comprehensive waste management plans for Nigeria and Lagos State respectively, covering thematic areas, goals, metrics, and a timeline from 2025 to 2040. The roadmap recommendations are aimed to guide waste management authorities in integrating MSW as a driver of economic growth.

The recommendations encompass objectives like formulating a national strategy, determining waste collection, and recycling key performance indicators (KPIs), updating regulations, enhancing governance, fostering circular practices, reducing waste, improving infrastructure, curbing pollution, and advancing recycled waste markets. The recommended plan also includes financing strategies and diverse targets over quick, short, medium, and long terms, showcasing a holistic and sustainable waste management approach.

Highlighted yellow boxes in the tables indicate feasible timeframes for goals. The framework also outlines some key indices to prompt authorities to set achievable targets. Monitoring progress against expected benchmarks is facilitated within the designated timeframes.

In developing the Lagos State SWM roadmap recommendations for this report (table ES.2), due consideration was given to the vision, goals, and key initiatives articulated in the *Lagos State Development Plan 2052* (LSDP 2052) as well as the specific programs and projects contained in the *Medium-Term Sector Strategies* (MTSS). The state’s draft plastic waste management policy and the current efforts to initiate a state-level EPR scheme were also considered.

Developing Nigeria’s MSW sector will require effective cooperation and collaboration between federal and state governments and other sectors, as well as among the states, to articulate a coherent national strategy and policy framework. A shared infrastructure model should also be promoted, as discussed earlier in this report. Lagos State, which is usually seen as a pacesetter on MSW in the Nigerian context, can play a particularly important role in this regard in the following ways: (1) Provide technical assistance to some other states that may desire to replicate its successful MSW initiatives; (2) Provide active support for key national-level MSW policies, regulations, tools, and initiatives which will be crucial for facilitating the pace and buy-in by other states; and (3) Pilot some of the recommended SWM initiatives such as two-way waste segregation and disincentivizing SUP packaging in hotels, restaurants, and catering businesses to provide useful learning and implementation templates for the other states.

Table ES.1 National MSW roadmap recommendations

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
1. Effective National SWM Strategy and Governance Framework						
1.1 Develop national SWM strategies with long-term (2025–2040) collection and treatment targets for plastics and other solid wastes.	National SWM strategy documents approved	National				
1.2 Establish realistic and detailed KPIs for MSW authorities to drive and track progress on the subnational and national targets.	SWM KPIs aligned with stakeholders and implemented	National				
1.3 Update existing policy, regulatory, and legal instruments at subnational and national levels for effective implementation of the SWM strategy	a) Revised NPSWM and Operational Guidelines approved	National				
	b) Revised NPPWM and Operational Guidelines approved	National				
	c) Revised Operational Guidelines for EPR Implementation approved	National				
1.4 Streamline and harmonize the roles and responsibilities of MSW authorities at subnational and national levels to eliminate duplications, and establish a National Committee on SWM to enhance cooperation, coordination, oversight, and effectiveness	SWM Administration and Operational Frameworks developed and implemented	National				
1.5 Continuously build robust institutional capacity for effective SWM at national and subnational levels, including Local Government Councils (LGCs).	National SWM Capacity Building Framework developed and adapted at state level	National				
1.6 Establish a national SWM database hosted on a shared platform for integrated reporting and monitoring of KPIs by national and state MSW authorities.	a) National SWM database launched	National				
	b) Nationwide baseline analysis on SWM launched	National				
	c) Plastic Life Cycle Assessment Report launched	National				
2. Acceleration of the Transition to a Circular Economy Model						
2.1 Develop and implement appropriate policy frameworks to enable the circular economy transition and promote waste reduction, reuse, and recycling.	Nigerian Circular Economy Roadmap launched and adapted at state level	National				

Table ES.1 National MSW roadmap recommendations (contd.)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
2.2 Promote responsible waste management culture at personal, home, and institutional levels to drive sustainable waste management practices.	National Waste Management Awareness and Advocacy Campaign implemented	National				
2.3 Reduce plastic consumption, particularly single-use plastics (SUP) , and promote reusable and non-plastic alternatives, e.g., returnable glass bottles.	a) Nonrecyclable plastics phased out for packaging and household products	National				
	b) Tax imposed on virgin plastics for all applications					
	c) Additional levy imposed on SUP food/ beverage packs and cutlery in hotels/ restaurants	National				
	d) Additional charge imposed on plastic shopping bags at point of sale	National				
2.4 Create domestic market opportunities for recycled plastics and organic fertilizers, including development of relevant industrial standards for recycling and composting.	a) Regulation on mandatory recycled content for SUP packaging implemented.	National				
	b) Guidelines and incentives for recycled content in building/construction industry implemented	National				
	c) National masterplan on organic fertilizer development implemented	National				
	d) Public Procurement Act updated to prioritize green procurement	National				
	e) Common regional standards for recycled plastics adopted to enable recycling at scale	National				
2.5 Boost local innovation and commercialization of products from recycled plastic/other wastes and bio-based substitutes for plastics as well as machineries and tools for SWM.	National Solid Waste Sector Innovation Fund and implementation guidelines launched	National				

Table ES.1 National MSW roadmap recommendations (contd.)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
3. Expansion of MSW Collection and Treatment Infrastructure						
3.1 Conduct a comprehensive nationwide SWM infrastructure gap analysis to determine needs and funding requirement.	SWM infrastructure adequacy plan approved	National				
3.2 Improve sorting/segregation rates by providing facilities and incentives for at-source separation of waste at households and other waste generation points.	a) Ratio of households with segregated wastebins improved	States/FCT	_%	_%	_%	_%
	b) Compartmentalized trucks standardized for waste collection	States/FCT				
	c) Waste sorting/segregation rate improved progressively	States/FCT	_%	_%	_%	_%
3.3 Strengthen the capacity of the informal sector and SME players to enhance their effectiveness and growth.	Financial and operational capacity development plan for informal sector implemented	States/FCT				
3.4 Provide adequate fleet of suitable waste collection vehicles (including for underserved communities) to ensure regular and effective evacuation of waste.	a) Coverage of MSW services (formal collection rate) improved	States/FCT	_%	_%	_%	_%
	b) Plastic waste collection rate improved	States/FCT	_%	_%	_%	_%
3.5 Incentivize private sector investments in material recovery facilities (MRFs), including composting plants for organic fertilizer production.	a) At least one medium or large-scale MRF plant established in each state	National/ States/FCT	_#	_#	_#	_#
	b) Ratio of composted organic waste improved	States/FCT	_%	_%	_%	_%
3.6 Incentivize private sector investments in mechanical and chemical plastic recycling plants .	Plastic recycling rate improved	National/ States/FCT	_%	_%	_%	_%
3.7 Incentivize refuse derived fuels (RDF) to boost offtake of nonrecyclable and hard-to-recycle plastic and other waste materials.	Number of factories adopting RDF increased	National/ States/FCT	_#	_#	_#	_#
3.8 Incentivize investment in engineered/sanitary landfills to minimize the volume of residual waste in open dumpsites.	Engineered/sanitary landfills established in key cities	National/ States/FCT	_#	_#	_#	_#
3.9 Incentivize investments in specialized facilities for separation, collection, and treatment/disposal of medical and other hazardous solid wastes .	Specialized waste facilities established in key cities for medical/other hazardous solid waste	National/ States/FCT	_#	_#	_#	_#

Table ES.1 National MSW roadmap recommendations (*contd.*)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
4. Improvement of Pollution Management and Control						
4.1 Minimize the volume of mismanaged solid waste through improved MSW collection, treatment, and disposal.	a) Ratio of mismanaged MSW reduced	States/FCT	_%	_%	_%	_%
	b) Ratio of mismanaged plastic waste reduced	States/FCT	_%	_%	_%	_%
4.2 Eliminate open burning of waste (including by municipal authorities and other agencies) through enforcing relevant laws and regulations.	a) Ratio of burned MSW reduced	States/FCT	_%	_%	_%	_%
	b) Ratio of burned plastic waste reduced	States/FCT	_%	_%	_%	_%
4.3 Eradicate drainage and marine litter by plastic and other solid waste.	a) Ratio of MSW litter in marine body reduced	States/FCT	_%	_%	_%	_%
	b) Ratio of plastic waste litter in marine body reduced	States/FCT	_%	_%	_%	_%
4.4 Reduce GHG emissions from mismanaged solid waste.	GHG emissions reduced	States/FCT	_#	_#	_#	_#
5. Establishment of Sustainable Financing Framework for SWM						
5.1 Optimize private sector investments and financing to reduce the current overreliance on public revenue	a) Credible PPP framework for the SWM sector implemented, attracting incremental investment	National/ States/ FCT	\$ _	\$ _	\$ _	\$ _
	b) Mandatory EPR scheme implemented nationwide for major waste streams	National/ States/ FCT	\$ _	\$ _	\$ _	\$ _
5.2 Leverage other finance channels to augment funding for SWM	a) Cost-reflective tariffs implemented in appropriate districts for MSW collection services	States/FCT				
	b) Virgin plastics tax fund wholly dedicated to plastic waste management	National/ States/ FCT				
	c) Development and donor funding opportunities optimized	National/ States/ FCT	\$ _	\$ _	\$ _	\$ _

Source: World Bank.

Note: EPR = Extended producer responsibility, FCT = Federal Capital Territory, FMinv = Federal Ministry of Environment, GHG = greenhouse gas, KPI = key performance indicator, LGC = Local Government Councils, MSW = municipal solid waste, NPPWM = National Policy on Plastic Waste Management, NPSWM = National Policy on Solid Waste Management, SUP = single-use plastic, SWM = solid waste management.

Table ES.2 MSW roadmap recommendations for Lagos State

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
1. Lagos State SWM Strategy and Governance Framework						
1.1 Develop and implement a comprehensive MSW strategy for Lagos State to achieve the MSW vision and targets defined in the Lagos State Development Plan 2052.	a) A diagnostic review of SWM (including infrastructure analysis) in Lagos State completed (currently WIP)	State				
	b) Statewide baseline analysis on plastic and other solid waste completed and integrated into the national database	State				
	c) Realistic SWM KPIs, linked to the national targets, developed	National/State				
	d) Lagos State MSW Strategy aligned to the LSDP SWM Plan launched	State				
1.2 Update existing state policy, regulatory, and legal instruments for effective implementation of the SWM strategy	a) Lagos State Plastic Management Policy revised to align with NPPWM and LSDP 2052, operational guidelines developed and implemented	State				
	b) Lagos State laws and regulations on all categories of solid waste updated and enforced	State				
1.3 Continuously build robust institutional capacity (knowledge/tools/funding) for effective SWM at State and Local Government Council (LGC) levels.	a) LAWMA reorganized or restructured based on the Lagos SWM diagnosis and benchmarking of counterparts in select peer cities	State				
	b) Responsibility for SWM outside of the Lagos Metropolitan Area devolved to LGCs	State				
	c) Per person budgetary allocations for SWM improved incrementally	State		\$5	\$7	\$10
	d) Full SWM cost recovery achieved through tariffs, levies (including EPR), and relative taxes	State	50%	100%	100%	100%

Table ES.2 MSW roadmap recommendations for Lagos State (*contd.*)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
2. Acceleration of the Transition to a Circular Economy Model						
2.1 Support the federal government in the development and implementation of the Nigerian Circular Economy Roadmap and related recommendations in this report to boost the effectiveness of the Circular Lagos Initiative.	Circular Lagos Initiative strengthened and aligned to the National Circular Economy Roadmap	National/State				
2.2 Promote responsible waste management culture at personal, home, and institutional levels to drive sustainable waste management practices.	Waste Management Awareness and Advocacy Campaign implemented	National/State				
2.3 Enforce national policies and regulations on reduction of plastic consumption, particularly single-use plastics , and promote reusable and nonplastic alternatives, e.g., returnable glass bottles.	a) Non-recyclable plastics phased out for packaging and household products	National				
	b) Tax imposed on virgin plastics for all applications	National				
	c) Additional levy imposed on SUP food/ beverage packs and cutlery in hotels/ restaurants	National/State				
	d) Additional charge imposed on plastic shopping bags at point of sale	National/State				
2.4 Boost market opportunities for recycled plastics and organic fertilizers.	a) Regulation on mandatory recycled content for SUP packaging implemented	National				
	b) Guidelines and incentives for recycled content in building/construction industry implemented	National/State				
	c) National masterplan on organic fertilizer development implemented in Lagos State	National/State				
	d) Lagos State Public Procurement Law updated to prioritize green procurement	State				
2.5 Boost local innovation and commercialization of products from recycled plastic/other wastes and bio-based substitutes for plastics as well as machineries and tools for SWM.	National Solid Waste Sector Innovation Fund and implementation guidelines implemented in Lagos State	National/State				

Table ES.2 MSW roadmap recommendations for Lagos State (*contd.*)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
3. Expansion of MSW Collection and Treatment Infrastructure						
3.1 Establish enabling environment for large-scale private sector investments to expand and modernize waste collection, treatment, and disposal services to deliver the 2052 target outcomes.	Increased large-scale private investments in SWM in Lagos State	State				
3.2 Strengthen the capacity of the informal sector and SME players to enhance their effectiveness and growth.	Technical and financial support systems for informal sector and PSPs implemented	State				
3.3 Deploy and enforce the use of two-way (wet and dry) segregated wastebins rates for at-source separation of waste at households and other waste generation points.	a) Ratio of households with segregated wastebins improved	State	_%	_%	_%	_%
	b) Compartmentalized trucks standardized for waste collection	State				
	c) Waste sorting/segregation rate improved progressively	State	_%	_%	_%	_%
3.4 Incentivize investment in adequate fleet of suitable waste collection vehicles (including for hard-to-reach areas) to ensure regular and effective evacuation of waste.	a) Coverage of MSW services (collection rate) improved	State	_%	_%	_%	_%
3.5 Incentivize investment in additional transfer loading stations incorporating mini material recovery facilities (MRFs) in phases across the state in line with the LSDP 2052.	Thirty new transfer loading stations commissioned in phases	State				
3.6 Incentivize investment in large-scale MRFs with organic fertilizer plants through private sector collaboration .	a) Three new large-scale MRF plants established in Lagos State	State				
	b) Ratio of composted organic waste improved	State	_%	_%	_%	_%
3.7 Incentivize investment in adequate mechanical/chemical plastic recycling and upcycling capacities to transform Lagos into a national and regional plastic recycling hub .	a) Plastic waste collection rate improved	State	_%	_%	_%	_%
	b) Plastic waste recycling rate improved	State	_%	_%	_%	_%
3.8 Incentivize investment in refuse derived fuels (RDF) by factories to boost offtake of nonrecyclable and hard-to-recycle plastic and other waste materials.	Number of factories adopting RDF increased	State	_#	_#	_#	_#

Table ES.2 MSW roadmap recommendations for Lagos State (*contd.*)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
3.9 Incentivize investment in engineered/sanitary landfills to minimize the volume of residual waste in open dumpsites.	One engineered/sanitary landfills established in Lagos State	State				
3.10 Incentivize investments in specialized facilities for separation, collection, and treatment/disposal of medical and other hazardous solid wastes .	Adequate facilities established in Lagos State for medical/other hazardous solid waste	State				
4. Improvement of Pollution Management and Control						
4.1 Minimize the volume of mismanaged solid waste through improved MSW collection, treatment, and disposal.	a) Ratio of mismanaged MSW reduced	State	_%	_%	_%	_%
	b) Ratio of mismanaged plastic waste reduced	State	_%	_%	_%	_%
4.2 Eliminate open burning of waste (including by municipal authorities and other agencies) through enforcing relevant laws and regulations.	a) Ratio of burned MSW reduced	State	_%	_%	_%	_%
	b) Ratio of burned plastic waste reduced	State	_%	_%	_%	_%
4.3 Install barriers at major inlets to trap plastic and other solid waste and eradicate marine litter .	a) Ratio of MSW litter in marine body reduced	State	_%	_%	_%	_%
	b) Ratio of plastic waste litter in marine body reduced	State	_%	_%	_%	_%
4.4 Reduce GHG emissions from mismanaged solid waste through effective management of dumpsites and proper decommissioning of filled sites.	a) Biogas plant established at each major dumpsite	State	_#	_#	_#	_#
	b) GHG emissions reduced	State	_#	_#	_#	_#
5. Establishment of Sustainable Financing Framework for SWM						
5.1 Optimize private sector investments and financing to reduce the current overreliance on public revenue	a) Credible PPP framework for the SWM sector implemented, attracting incremental investment	State/National	\$_	\$_	\$_	\$_
	b) Mandatory EPR scheme implemented for major waste streams	National	\$_	\$_	\$_	\$_

Table ES.2 MSW roadmap recommendations for Lagos State (*contd.*)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
5.2 Leverage other finance channels to augment funding for SWM	a) Cost-reflective tariffs implemented in appropriate districts for MSW collection services	State				
	b) Long-term funding accessed from green bonds	State				
	c) Virgin plastics tax fund wholly dedicated to plastic waste management	National/State				
	d) Development and donor funding opportunities optimized	State/National	\$ _	\$ _	\$ _	\$ _
	e) Per person budgetary allocations for SWM improved	State/National		\$5	\$7	\$10

Source: World Bank.

Note: EPR = extended producer responsibility, GHG = greenhouse gas, KPI = key performance indicator, LAMATA = Lagos Metropolitan Area, LAWMA = Lagos Waste Management Authority, LSDP = Lagos State Development Plan 2052, LGA = local government area, LGC = local government councils, NPPWM = National Policy on Plastic Waste Management, MSW = municipal solid waste, PPP = public-private partnership, PSP = private sector partnership, RDF = refuse derived fuel, SME = small and medium enterprise, SUP = single-use plastic, SWM = solid waste management.

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OVERVIEW OF THIS STUDY



Objectives of This Study

Lagos State, the primary focus of this study, is one of Nigeria's 36 component states with 180 km of Atlantic coastline. It is the country's major economic hub and home to Lagos, Africa's most populous city. For Nigeria, Africa's largest economy and most populous country with a young, fast-growing, and rapidly urbanizing population, sustaining economic growth while meeting its development objectives is crucial to the country's stability and leadership role in Africa.¹

Nigeria has made considerable progress in broad socioeconomic terms in recent years, including raising the literacy rate from 55 percent in 2003 to 62 percent in 2018, improving life expectancy from 53.6 years in 2000 to 62.6 years in 2019, and overtaking South Africa as the continent's largest economy.² Similar progress is noticeable in the quest for a sustainable environment, with the country taking active interest and encouraging, albeit fledgling, steps toward a circular economy transition, as highlighted in several sections of this report. As with many peer countries, however, Nigeria continues to face substantial development-related challenges, including prevalent poverty, inadequate infrastructure, and social and political fragility, largely attributed to governance and resource management capacities. In addition, the country faces various environmental stresses linked to human activity such as poor management of solid waste, including plastic waste, whose dimensions, implications, and potential mitigations are examined in depth in this study.

The aim of this PROBLUE-funded study is to improve the knowledge base and increase capacity for Lagos State to enhance solid waste management (SWM) and reduce marine plastic pollution by promoting sustainable plastic management through the 3 R principles (reduce, reuse, recycle). The study is divided into four key components, which cover all of Nigeria but focus particularly on Lagos State: (1) Solid waste management and marine plastic pollution assessment and recommendations; (2) Value chain diagnostics and recommendations for plastics in Lagos, including circular business models, technologies, and job creation; (3) Assessment of plastic waste management in HCFs under COVID-19 and recommendations for improved management; and (4) Capacity strengthening, communication, dissemination, and project management.

This study, generously funded by PROBLUE, aims to enhance the knowledge base to improve SWM and reduce marine plastic pollution in Nigeria, with a particular focus on Lagos State, and strengthen policies in this sector. It also seeks to enhance the country's environmental management and climate policies through the World Bank's Climate Resilience and Environmental Management (CREM) Programmatic Advisory Services and Analytics (PASA, P177809). In particular, the link to this goal stems from the inclusion of the waste sector in Nigeria's Nationally Determined Contribution (NDC) and the concurrent need for relevant policies and strategic alignment in the SWM sector. Refer to box O.1 for more information about the PROBLUE multi-donor trust fund.

The findings of PROBLUE-supported activities also inform other World Bank programs and initiatives, such as the West Africa Coastal Areas (WACA) Program (P166218) and the Lagos Platform for Development (LPD, P175031). The WACA Program has focused on formulating a multi-sectoral resilience plan in three coastal states: Cross River, Delta, and Lagos. This multi-sectoral plan

¹ For more information on Lagos, visit the official website of Lagos Geo Info at <http://www.lagosgeoinfo.com.ng/lagos.php>.

² Data on literacy rate in Nigeria taken from the official website of the World Bank (accessed September 4, 2023), at <https://data.worldbank.org/indicator/SE.ADT.LITR.ZS?locations=NG>. Data on life expectancy at birth taken from the official website of the World Health Organization (accessed September 4, 2023), at <https://data.who.int/countries/566#:~:text=In%20Nigeria%2C%20life%20expectancy%20at%20birth%20has%20improved%20by%20%20to%2073.3%20years%20in%202019.>

focuses on interventions to address flooding, erosion, and pollution challenges. Therefore, these PROBLUE activities served as a knowledge source for the plastics pollution aspects of the plan, particularly for Lagos State, falling within their common scope.

The LPD is a multi-sectoral PASA with strong links to PROBLUE activities. The objective of the platform is to understand the role of urbanization in Lagos State as an engine for inclusive, sustainable, and resilient growth and to support the Lagos State Government in identifying and advancing priority interventions aligned with the *Lagos State Development Plan 2052* (LSDP 2052). In this regard, one of the priority sectors that has been identified by Lagos State is SWM. The platform, therefore, has benefited from the diagnostics and technical analysis performed under PROBLUE activities for the development of short-, medium-, and long-term plans to enhance solid waste and plastics management in Lagos State.

BOX 0.1 THE PROBLUE MULTI-DONOR TRUST FUND

PROBLUE is a multi-donor trust fund (MDTF) administered by the World Bank. The MDTF was launched in 2018 to support sustainable and integrated development of marine and coastal resources in a healthy ocean (the blue economy).

PROBLUE supports the implementation of Sustainable Development Goal 14 (Life Under Water) and is fully aligned with the World Bank's mission to end extreme poverty and boost shared prosperity on a livable planet. PROBLUE is part of the World Bank's overall Blue Economy program, which takes a multi-pronged, coordinated approach to ensuring the protection and sustainable use of marine and coastal resources.

PROBLUE focuses on the following four key themes:

- Improving fisheries by tackling the underlying causes of overfishing and strengthening aquaculture sustainability,
- Addressing threats posed to ocean health from marine pollution, including litter and plastics, from marine or land-based sources,
- Enhancing sustainability of key oceanic sectors such as tourism, maritime transport, and offshore renewable energy, and
- Building government capacity to manage marine resources, including nature-based solutions, and to mobilize private sector finance.

PROBLUE was established in response to client demand, and it helps the World Bank identify current trends and emerging threats to oceans, and solutions for action.

Note: For more information on PROBLUE, visit the official World Bank website at <https://worldbank.org/problue>.

Audience of This Report

This report aims to contribute to the body of knowledge on plastic waste management in Lagos State and, more broadly, in Nigeria. It also shares international experiences of other countries highlighting key mechanisms of implementation and factors for success (or failure). The aim is to provide practical information, guidance, and a roadmap to inform the work of national and local solid waste authorities, practitioners, academics, researchers, and graduate students in Nigeria, by providing targeted recommendations on reducing marine litter through the adoption of circular policies in the upstream as well as creating circular markets in collaboration with other sectors in the downstream plastic waste value chain.

Overview of This Report

Several knowledge products were created in support of this study, and this report serves as the synthesis. This report serves to synthesize the work carried out by various consultants, in coordination with the Federal Government of Nigeria and other key public and private stakeholders, such as the Federal Ministry of Environment (FMEEnv), National Environmental Standards Regulations and Enforcement Agency (NESREA), Lagos State Ministry of Environment (LS-MoEnv), Lagos Waste Management Authority (LAWMA), and Lagos State Environmental Protection Agency (LASEPA), between 2021 and 2023.

The study focuses on Lagos State, the country's most populous state. The first two chapters provide a broad overview of the municipal solid waste (MSW) and plastic waste management scenario, respectively, in Lagos State. The chapters are structured to provide the status, gaps and challenges, and recommendations to improve the SWM sector, better manage plastics waste, and eventually transition to a circular economy. Chapter 3 provides an extended producer responsibility (EPR) framework for plastic packaging in Nigeria. To understand how public behavior currently affects overall SWM and how changes in behavior can reduce marine pollution in Lagos State, a study of 1,100 households was conducted. This study and its analysis are presented in chapter 4. Chapter 5 provides financial and economic analyses of MSW in Nigeria generally and in Lagos State specifically. Recommendations from the various chapters for the way forward feed into the roadmap presented in chapter 6. Chapter 7 summarizes the main conclusions from the extensive study and analysis conducted for this report.

In addition, seven topic sheets are provided, summarizing key topics related to MSW broadly in Nigeria and specifically for Lagos State. These include an overview of SWM in Nigeria (topic sheet 1), a summary of plastic waste management in Nigeria (topic sheet 2), emissions of particulate matter and greenhouse gases from MSW (topic sheet 3), plastic waste generated from healthcare facilities (topic sheet 4), characterization of the types of waste, including various plastic wastes, at the Olusosun dumpsite in Lagos (topic sheet 5), a plastic hotspot analysis of Lagos State (topic sheet 6), and a summary of business models relevant to plastic waste recycling (topic sheet 7).

A Note on Data Limitations

This report compiles MSW management and other related data (for example, population) at the country level for Nigeria as well as at the Lagos State level. Every effort has been made to verify sources and find the most accurate and recent information available.

SWM and population estimates are two crucial aspects of MSW service delivery and planning. In Nigeria, current and accurate data are often limited, which can lead to significant challenges in implementing effective policies and programs. This is due to several factors such as inadequate data collection methods, inconsistencies in data collection methodologies, and discrepancies between different data sources, including estimates from various government agencies and academia.

In this study, primary data were gathered to gain deeper insights into waste management practices in Lagos State. This enables the establishment of baseline data, as well as data collection methodology, which can be used to evaluate the effectiveness of future policy interventions. Some examples of primary data collection in Lagos State for this study include the following: (1) Fieldwork at multiple HCFs to estimate the quantity of infectious and noninfectious plastic waste generated (May 2021 and October 2022); (2) A waste characterization survey at the Olusosun dumpsite to conduct a compositional analysis of MSW generated (September 2021 and February 2022); (3) A survey of 1,100 households to enrich the analysis from the Nigerian General Household Survey–Panel (NGHS–Panel) on socioeconomic data and to provide detailed information on plastic consumption and solid waste generation (February 2023); and (4) A plastic hotspot analysis to identify leakage points into the marine environment.

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CHAPTER 1

SOLID WASTE GENERATION AND MANAGEMENT IN LAGOS STATE

Further information on this topic is available at:
*Improving Solid Waste and Plastics Management in Lagos State: An
Analysis of the Solid Waste Sector* (Internal report) and *Improving
Solid Waste and Plastics Management in Lagos State: An Institutional
Analysis* (Internal report).



Nigeria, with a population of over 218 million in 2022, is the seventh-most populated country in the world and most populous country in Africa. Urbanization levels are rising rapidly, estimated at 54 percent, and growing at a rate of 3.8 percent annually. The country's economy is also the largest in Africa in terms of GDP, estimated at \$477.39 billion in current US dollars in 2022.³ Rapid economic development is expected in the coming decade, along with a growing middle class and increased consumption of goods and services.

Lagos State is the smallest but most populous state in Nigeria estimated at over 24 million residents, and is home to Africa's largest coastal city, Lagos (Lagos Bureau of Statistics 2016). Geographically, the state lies on the Atlantic Ocean and has a coastline of 180 km. It is a crucial economic hub for Nigeria, contributing over 15 percent of Nigeria's GDP and has been touted as Africa's eighth largest economy (MEPB Nigeria 2022). This has spurred rapid and large internal and regional migration as well as growth in population density and urbanization, putting pressure on the existing infrastructure which has not kept pace with the population growth. All these factors together lead to pressing municipal solid waste (MSW) challenges in Lagos State, exacerbated by the large quantities of waste generated, limited space, and widespread informal settlements outside Lagos city limits.

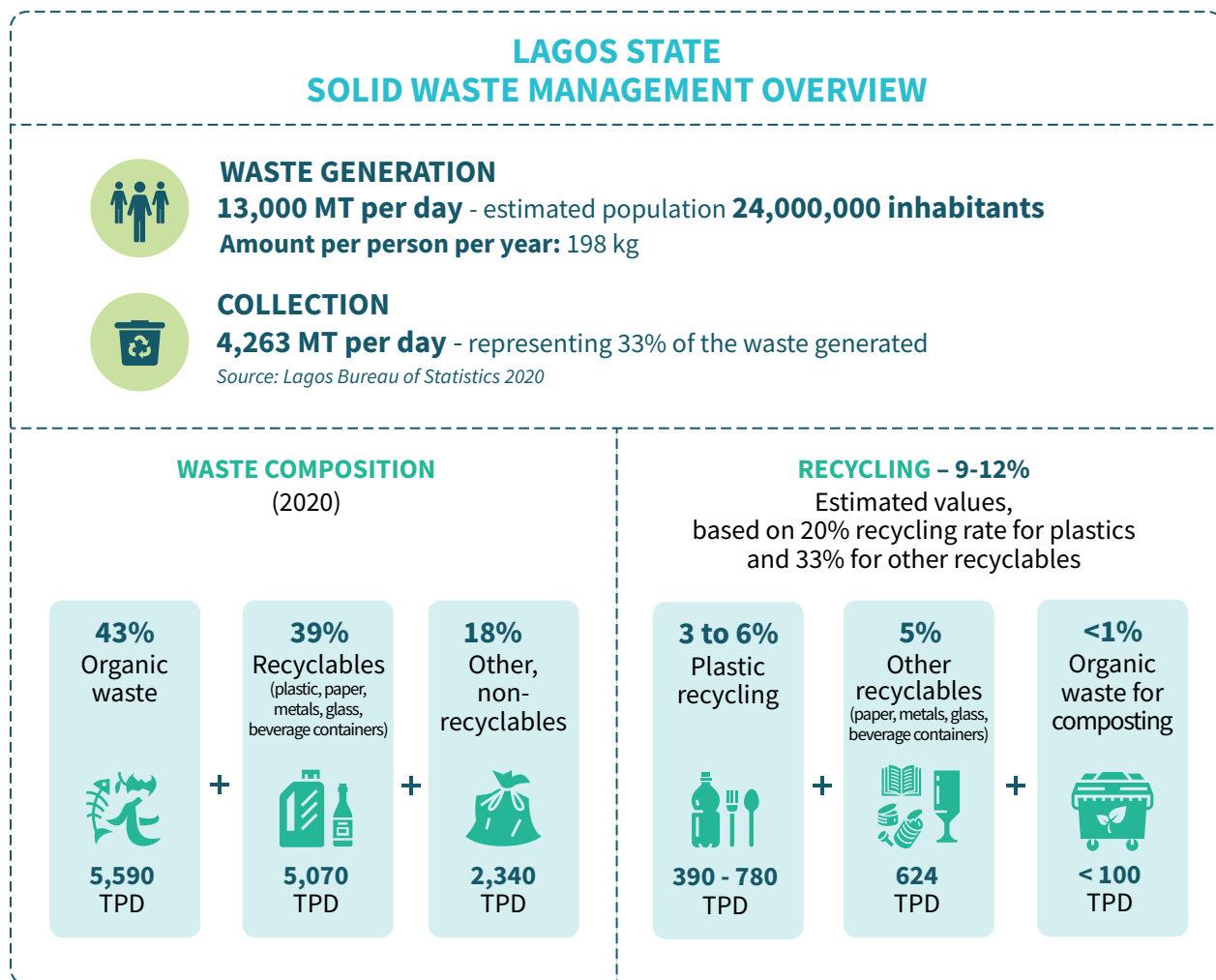
The chapter aims to shed light on the current state of the MSW sector in Lagos State and identify areas for improvement and growth (section 1.1). This is followed by an analysis of state-level policies and institutional structure related to MSW in section 1.2. The role of the private sector in managing solid waste in the state is discussed in section 1.3. For more detailed information on solid waste management (SWM) at the national level, see topic sheet 1.

1.1 MUNICIPAL SOLID WASTE LANDSCAPE IN LAGOS STATE

In Nigeria, Lagos State stands out as a frontrunner in the field of waste management. It offers capacity building and support services to a few other states and neighboring cities in West Africa, including engineering support, bin fabrication and deployment, policy guidance, and export of technical support. This is made possible due to the state's experience with large-scale investment from both public and private sectors as well as the introduction of innovative models and technologies, such as public-private partnership (PPP), transfer loading stations, recycling banks, communal waste depots, static bin fabrication, and other waste management measures. The MSW landscape in the state is described in section 1.1.1. Despite the achievements and contributions of Lagos State through Lagos Waste Management Authority (LAWMA), there are still multiple challenges and gaps in the system, summarized in the subsequent section, that need to be addressed. Finally, a series of recommendations are provided in section 1.1.3 to overcome obstacles in improving and expanding service delivery along the MSW chain. Figure 1.1 presents an overview of SWM in Lagos State.

³ This information is taken from the database of the Nigeria Country-level Data website of the World Bank, Washington, DC (accessed September 4, 2023), <https://data.worldbank.org/country/nigeria>.

Figure 1.1 Overview of SWM in Lagos State

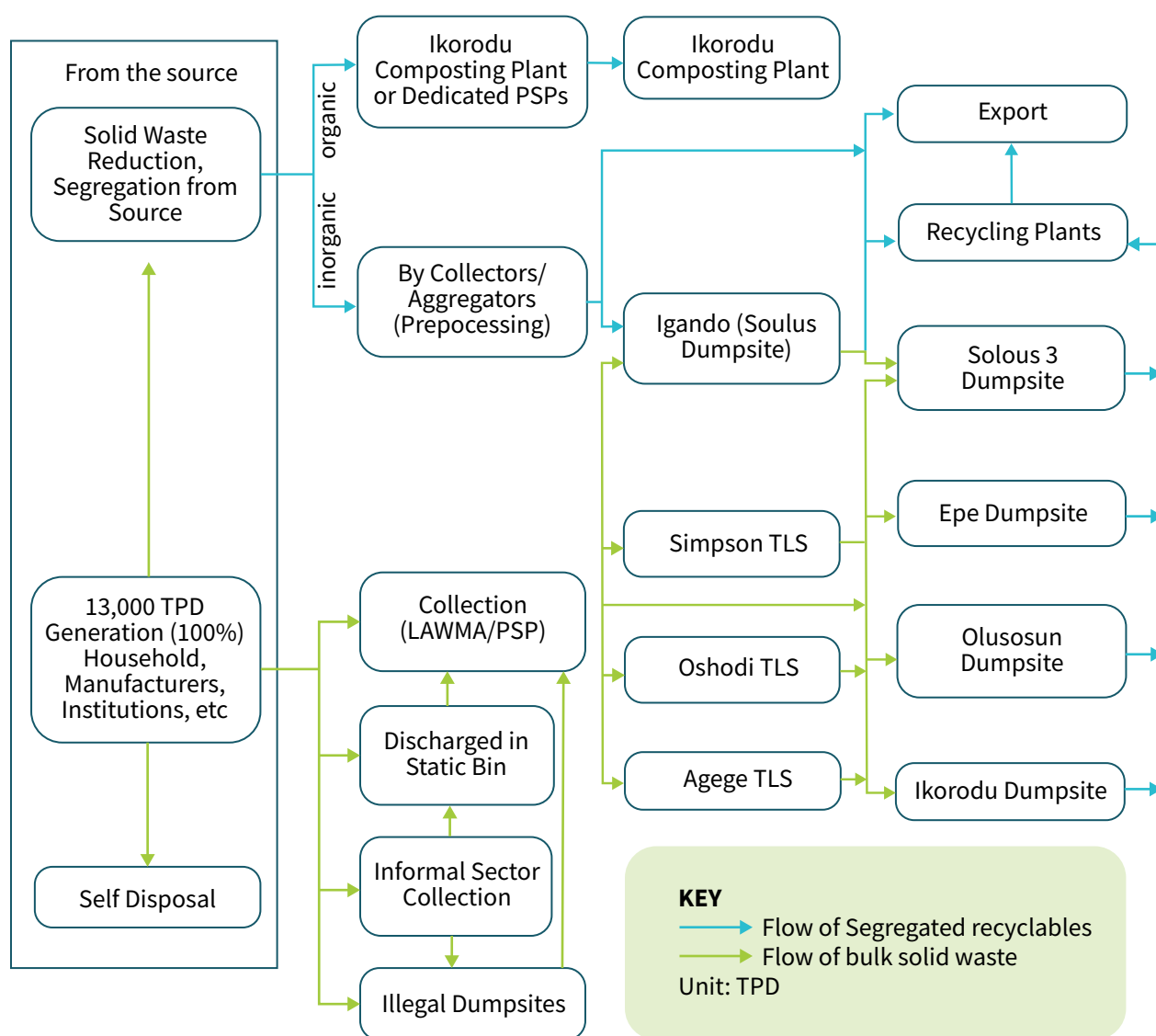


Source: Original calculations for this publication.
 Note: MT = metric tons, TPD = tons per day.

1.1.1 Current Status

Waste in Lagos originates from various activities and sources across the state and differs in composition, thereby requiring the deployment of different systems and infrastructures for their proper management. The MSW sector in the state is mapped in figure 1.2.

Figure 1.2 Overview of MSW sector in Lagos State



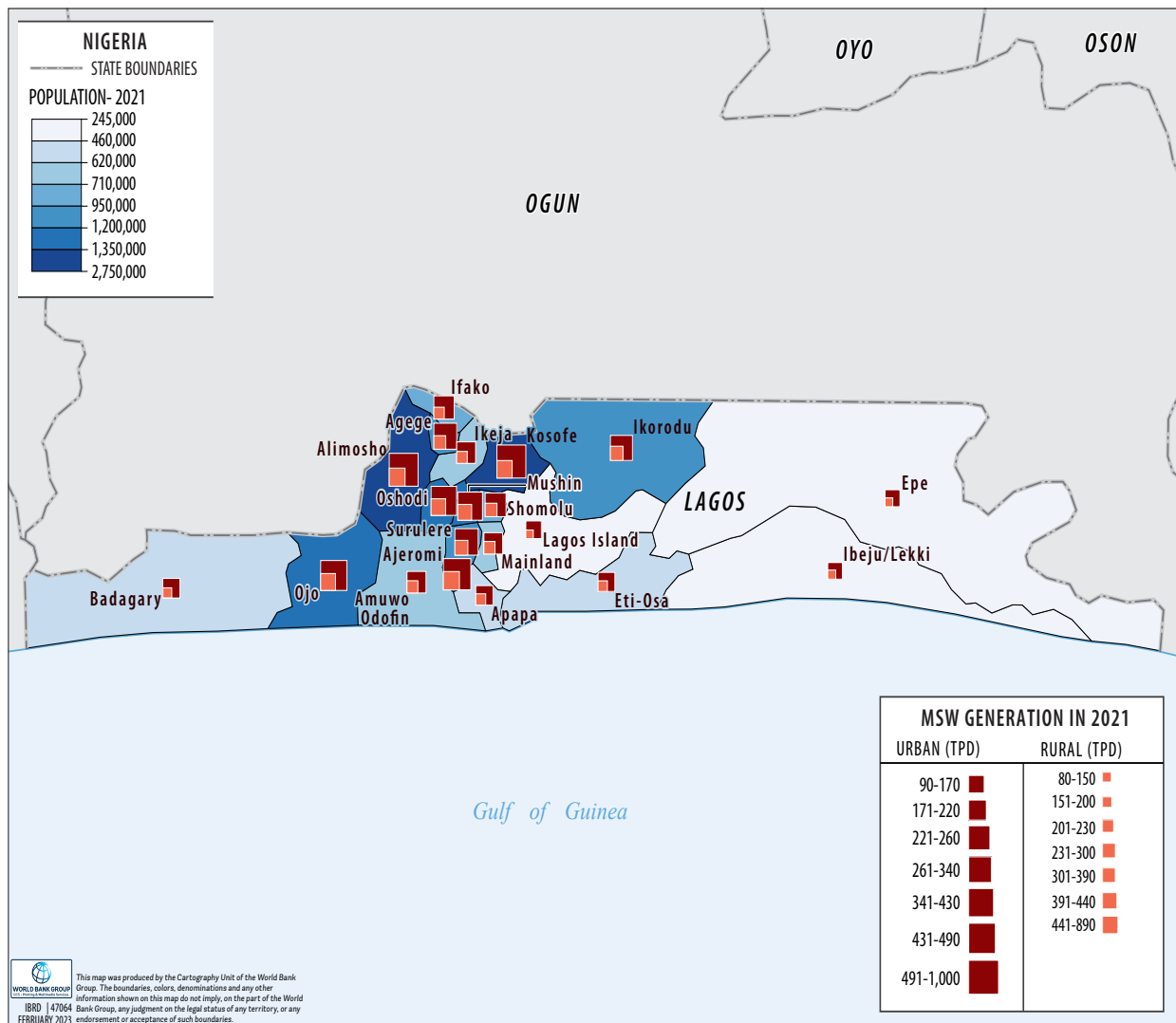
Source: World Bank 2024a (internal report).

Note: LAWMA = Lagos Waste Management Authority, MRF = material recovery facility, PSP = private sector partnership, TLS = transfer loading station, TPD = tons per day.

1.1.1.1 MSW Generation and Source Segregation

Lagos State generates 13,000 metric tons (MT) of solid waste approximately every day, with a generation rate of 0.54 kg per person per day, considering a population of 24 million. Of the 4.75 million MT of solid waste generated in 2021, between 33 and 54 percent was collected and disposed of through approved channels, while the remaining was uncollected and classified as mismanaged waste [Lagos Bureau of Statistics 2022; World Bank 2024a (internal report)]. Map 1.1 of solid waste generation across the state shows a higher concentration coming from central Lagos, highlighting the requirement for increased resources and facilities. MSW generation is projected to increase substantially in Lagos State in the future, as discussed in box 1.1.

Map 1.1 Spatial distribution of waste generated in Local Government Councils (LGCs) across Lagos State, 2021



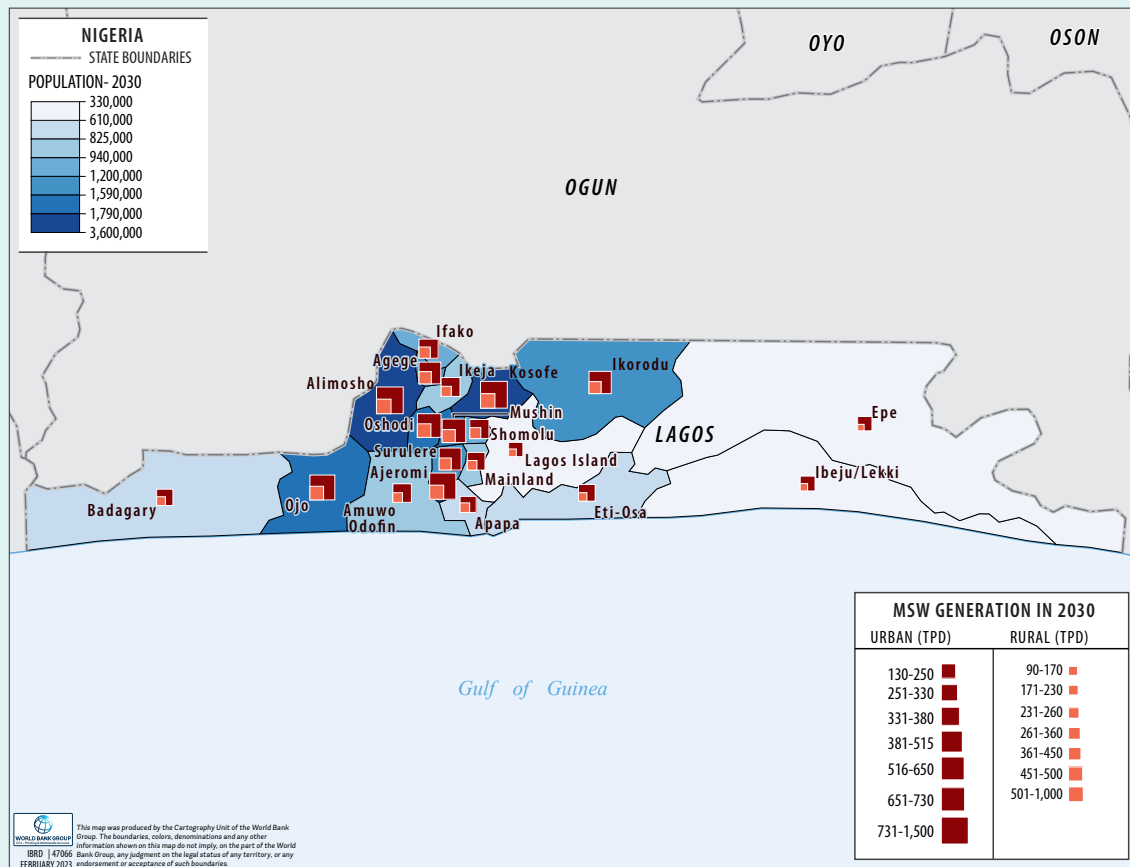
Note: TPD = tons per day.

The state has had limited success in source segregation. All tenements are legally required to obtain and maintain sufficient bins to store their waste; while LAWMA has provided bin specifications for households and commercial establishments, the challenge is the lack of enforcement and compliance, prompting the agency to issue an enforcement directive in 2022 (Premium Times 2022). Even when materials are sorted at the source, most waste collection trucks do not have compartments to keep the waste separate.

BOX 1.1 PROJECTIONS FOR MSW GROWTH IN LAGOS STATE

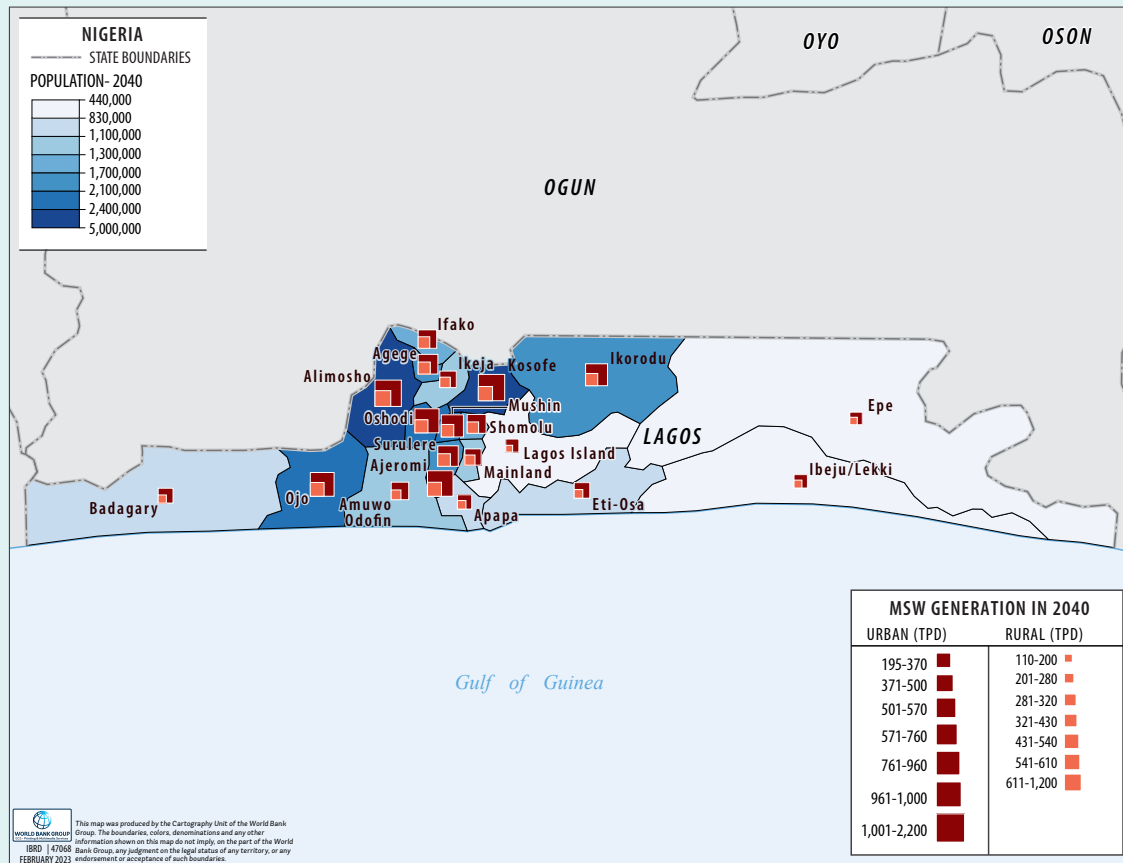
By 2030 and 2040, MSW generation in Lagos is expected to grow by 33 percent and 82 percent, respectively, with 17,300 tons per day (TPD) and 23,700 TPD of solid waste generated across the 20 local government areas (LGAs) in the state (maps B1.1.1 and B1.1.2). Map B1.1.1 shows the spatial distribution of MSW generated in the 20 LGAs in Lagos State in 2030, suggesting that the Lagos Central district will generate more waste due to high population density projections. This highlights the need for more facilities and equipment to manage the expected amount of solid waste from this district.

Map B1.1.1 Projected daily waste generation across 20 LGAs in Lagos State in 2030



Note: TPD = tons per day.

Map B1.1.2 Projected daily waste generation across 20 LGAs in Lagos State in 2040

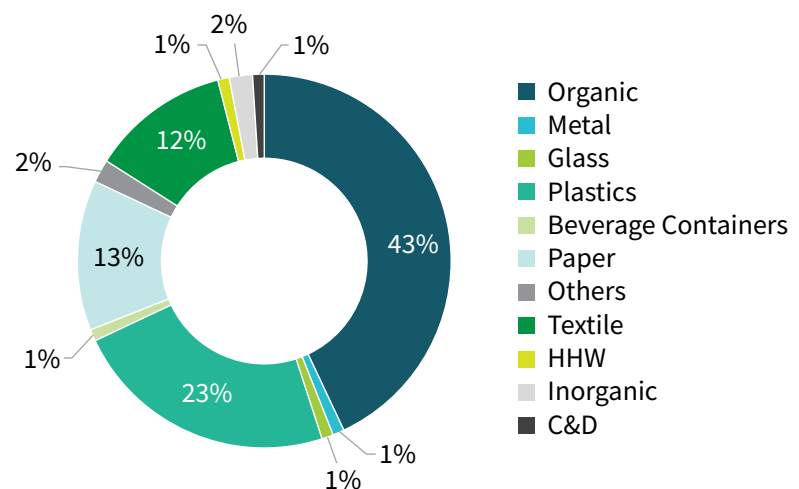


Note: LGA = local government area, TPD = tons per day.

1.1.1.2 Municipal Solid Waste Composition

Figure 1.3 shows the composition of waste in Lagos State. It mostly includes organic waste (43 percent), followed by plastic waste (23 percent), paper waste (13 percent), textile waste (12 percent) and other waste, which constitutes less than 10 percent of the collected waste (LAWMA 2020).

Figure 1.3 Waste composition in Lagos State, 2020



Source: LAWMA 2020.

Note: C&D = construction and demolition, HHW = household waste.

1.1.1.3 Municipal Solid Waste Collection and Transport

LAWMA and 487 licensed private companies collaborate to carry out solid waste collection services in Lagos. The combined efforts of LAWMA and these companies have increased waste collection from 0.79 million MT in 2018 to 1.56 million MT in 2020, according to the Lagos Bureau of Statistics.⁴ The state is serviced by 920 compactor trucks, making over 800 trips a day (both LAWMA and private sector partnerships [PSPs]). In addition, LAWMA procured 202 new trucks (including 102 compactors) in 2021 to improve service coverage and frequency of waste. However, additional collection trucks are required to meet collection needs, resulting in a financial gap that can be filled by the private sector. An estimated 1,000 trucks fleet can collect 2–4 million MT; however, precise data are scarce on the waste fleet productivity thus making it difficult to calculate how many trucks are necessary. Further studies are required in this area to establish accurate data.

The number of registered private collectors in Lagos State has increased fourfold in the last 15 years, employing over 3,500 staff (LAWMA 2021). Despite this growth, many micro and small enterprises in the waste business still operate in rural and low-income peri-urban areas without registering with the government. The criteria for registering as a private operator requires a minimum of two trucks and can cost up to ₦50 million, making it a financial challenge for entry into the sector.

Poor compliance with bin standardization and poor road accessibility, combined with traffic congestion, hinder efficient waste collection, and amplify operational inefficiencies. Waste collectors sometimes need to first empty bins on the ground and then manually scoop the waste into the trucks, taking more time to perform regular collection and leaving debris behind, causing further cleaning problems. The private sector service providers mainly operate in the Lagos metropolis, which only covers 63 percent of the state, leaving the remaining 37 percent with limited or no service. These areas generally have poor road infrastructure and low socioeconomic levels (Olukanni and Oresanya 2018).

A 2014 study found that service quality and productivity of private operators vary based on income level and other factors such as regulatory compliance and company experience. PSPs in medium- and high-income areas (for example, Ikoyi, Magodo, and Ikeja GRA) performed above average, while most PSPs in low-income areas performed below average, highlighting the correlation between service charge payment and waste collection (Agboje et al. 2014).

Small-scale private companies which predominate the waste collection business in Lagos face difficulties due to lack of experience, funds, operators, and management skills as well as inadequate service monitoring and poorly managed dumpsites. Often vehicles are stuck in dumpsites (mud, punctured tires, lack of ramps for unloading, and so on), taking hours just to unload the collected waste. The use of old and second-hand trucks leads to frequent breakdowns, causing waste accumulation and road littering. Long distances to waste dumpsites and heavy traffic also pose challenges, particularly during the rainy season; the platforms for the PSPs to discuss operational difficulties are inefficient.

⁴ Calculations based on data taken from *Abstract of Local Government Statistics 2019* and *Abstract of Local Government Statistics 2020*, released by the Lagos Bureau of Statistics, Nigerian Ministry of Economic Planning and Budget, Ikeja. Both documents are available on the official website of the Ministry of Economic Planning and Budget at <http://mepb.lagosstate.gov.ng/wp-content/uploads/sites/29/2020/08/Abstract-of-Local-Government-Statistics-Y2019.pdf> and <https://lagosmepb.org/wp-content/uploads/LGA-Statistics-ver-2020.pdf>.

1.1.1.4 Municipal Solid Waste Transfer Stations

The collected waste is transported to a treatment facility or transfer station or directly to a **dumpsite**. There are three operational transfer stations each with a capacity of 1,000 TPD and three additional transfer stations under construction. The transport is usually done by the same collection trucks, but there are also 10–15 transfer trailers (bulk movers) with a capacity of 30–40 MT each as well as tippers and trailers for special evacuation purposes. The transfer stations are being upgraded to include resource recovery activities within their facilities.

1.1.1.5 Recycling and Resource Recovery of MSW

According to the LAWMA recycling handbook published in 2020, community centers across the state collected 1,360 MT in 2019–20, a meager 0.06 kg per person per year, less than 1 percent of the potential, that is, an average of 7.5 kg per person per year of plastic waste generated at the national level.⁵

The state government partners with PSPs, either in the form of joint ventures or by granting permits to establish collection and sorting/processing facilities in the state. It is estimated that the recycling sector (spanning collection, sorting, and processing) employs over 10,000 people in the state. Although the number of registered recyclers has increased sixfold in the last couple of years, the state has more informal players compared to the number of registered processors and recyclers, currently estimated at 3,700 (Olatunji 2022).

A review of the status of resource recovery programs in Lagos State reveals that some are not effective in the long term and cease to operate. This can be attributed to several reasons, such as poor cost recovery and revenue generation, operational issues, lack of effectiveness of pertinent laws, and inadequate planning.

Since the issuance of direct waste resource recovery guidelines in 2014, the state government has established waste processing plants, including a material waste recovery facility at the Solous dumpsite, and an organic waste composting plant at Ikorodu, through PPP. LAWMA has entered a partnership to develop a biogas plant at Ikosi, in addition to an existing biogas plant at Ikorodu. The steel industry flourishes with the recycling of scrap metals collected from dumpsites around the country, and two manufacturing plants have been established in Lagos to utilize scrap metal in production. Although textile waste constitutes a significant waste stream, limited amounts are used in the state due to the lack of textile recycling companies (currently, there is only one large-scale textile recycling facility in Kaduna state).

Improvements have been recorded in the economic value of recyclables, such as the following:

- A marginal difference (about ₦30) in the pricing of aluminum cans between the buyers that offtake directly from waste pickers and end buyers (material converters).
- A wider difference of up to ₦90 for plastic waste between direct offtakers and end buyers due to multiple middlemen. This has a negative impact on the recovery rate of plastics in Lagos. The pricing regime within the solid waste sector is unregulated; this particularly affects waste

⁵ Nigeria's average plastic waste generation is hard to measure with estimates ranging from a low 7.5 kg per person per year up to 45 kg per person per year for cities like Lagos. It is clear from the data, however, that consumption is rising (HBF 2020).

pickers and sorters who only get paid a fraction of the actual market price for recyclable waste. This pricing model lowers their incentives to play an effective role in the waste value chain.

1.1.1.6 Municipal Solid Waste Treatment and Disposal

Most of the solid waste produced in Lagos State is disposed of in dumpsites, with only a small portion being recovered and recycled. Out of the world's 50 largest dumpsites, six are in Nigeria (D-Waste 2014). There are three main operational dumpsites in Lagos State and three additional satellite dumpsites that serve as backups; however, there are no sanitary landfills. The major disposal sites are Olusosun and Solous—consisting of Solous II and Solous III—with Solous I no longer in operation. Olusosun is in Ikeja, in the north of Lagos State, covers an area of 42.7 ha, and has been receiving about 10,000 TPD of waste since 1992. It is expected to reach full capacity in just a few years. Solous II and Solous III have a combined size of 13.8 ha and each receives an average of 2,250 cu. m of waste per day, approximately 1,200 TPD.

The satellite dumpsites include Ewu Elepe, Sangotedo in Eti-Osa LGC and Temu dumpsite in Epe LGC. They serve as backups for the three main dumpsites. They are considered temporary sites and receive an average waste of about 1,864 cu. m per day (UNIDO 2021).

With two of the main dumpsites, Olusosun and Solous III, having a remaining lifespan of only 14 and three years, respectively, as of 2023, the state government undertook a ₦2 billion dumpsite rehabilitation project in 2021 to elongate the lifespans of the dumpsites.⁶ There are plans to construct an integrated waste management facility at the 80 ha Epe dumpsite and close the three operational dumpsites that are near capacity, but these plans have not yet been put into action. The lack of a sanitary landfill in Lagos State has been attributed to the challenges posed by the state's waterlogged terrain which makes such a facility expensive to construct and risky to operate.⁷ The environmental impacts of mismanaged solid waste in Nigeria are summarized in box 1.2. A summary of the MSW flows in Lagos State is provided in figure 1.4.

Figure 1.4 Flow of MSW in Lagos State

		Collection	Disposal
LAGOS STATE Waste generation 13,000 TPD		Collected by service providers 20% 2,644 TPD	Dumpsite Official value by LBS - Lagos, 2000 38% 3,726 TPD
		Informal collection 17% 2,252 TPD	Sorting for recovery 9% to 12% 1,170 to 1,560 TPD
		Uncollected 62% 8,104 TPD	Unmanaged 62% 8,104 TPD

Source: Original figure for this publication.

Note: TPD = tons per day.

⁶ This information was provided during a stakeholder engagement session with the Managing Director of LAWMA, Mr. Ibrahim Odumboni on September 1, 2021.

⁷ Interview with official from the Sanitation Services Department, Lagos State Ministry of Environment and Water Resources.

BOX 1.2 ENVIRONMENTAL IMPACT OF MISMANAGED SOLID WASTE IN NIGERIA

The public health, environmental, and economic impacts of inadequate solid and plastic waste management continue to pose a significant threat to Nigeria—as in similar economies—in the form of air, water, and land pollution, particularly on the most socially vulnerable sections of the population. Indiscriminate disposal of waste obstructs public roads, waterways, drainages, and so on, resulting in flooding in both urban and rural areas thereby lowering the aesthetic appeal of cities. Flooded areas become breeding grounds for flies and pathogens that spread diseases such as malaria, cholera, and typhoid. According to the World Health Organization (WHO), four African countries accounted for just over half of all malaria deaths worldwide, with Nigeria topping the list with approximately 31.3 percent of the deaths (WHO 2022).

The decomposition of organic waste at dumpsites is a primary source of greenhouse gases (GHGs), which are released into the atmosphere without any treatment or control. This methane-rich gas also creates fire and explosion risks, particularly in the dry season, as well as bad odor. In Lagos State, major fire outbreaks at the Olusosun dumpsite in 2014 and 2018 caused serious air pollution and destroyed properties worth millions of Naira (Ugbodaga 2018; Sahara Reporters 2018).

Nigeria is the largest emitter of GHGs in West Africa, with emissions estimated at 322,337 ktons of CO₂e in 2020. While Nigeria must address climate change mitigation, its population already faces numerous impacts caused by a changing climate such as floods as well as water scarcity and sea level rise. The impacts of climate change are expected to worsen with the projected increase in MSW generation without a commensurate increase in capacity and funding for adequate MSW systems. Therefore, the country must also strengthen its adaptation efforts, including in the MSW sector through improved provision of services all along the waste value chain.

The open burning of solid waste is a significant contributor to smog and poor air quality in larger cities, including Nigeria, where solid waste accounts for 9.4 percent of GHG emissions (equivalent to 32.6 MTCO₂e), according to estimates in the country's Nationally Determined Contribution (NDC) 2021 update to the UN Framework Convention on Climate Change (FMEnv 2021). The leachate from dumpsites is a major source of underground and surface water contamination, particularly during the wet season. Most of the dumpsites lack monitoring wells, which makes it challenging to measure the extent of the impact caused by leachate on underground water resources, which are crucial to the livelihood and food security for millions of Nigerians (Onugba and Yaya 2008). Where monitoring wells are present, such as in Lagos State, the actual location of some of them are not known; therefore, no suitable safety measures are taken to prevent leachate percolation into underground aquifers.

An estimate of over 200,000 MT of plastic waste from land-based sources in Nigeria is discharged into the Atlantic Ocean annually, making it one of the top 20 countries contributing to marine litter (UNIDO 2021).

Note: Data on GHG emissions by Nigeria is taken from the World Bank website at <https://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE?locations=NG>.

1.1.2 Challenges in the MSW Value Chain in Lagos State

There are some major challenges related to solid waste generation and management at the household level in Lagos State which can be addressed quickly without significant resource implications. These include:

Lack of household waste segregation: The 1,100-household survey conducted for this study, described in box 1.3, reports that only 18 percent of households sorted their waste in the previous 30 days, while the remaining 82 percent did not. Household separation of waste (wet/dry, recyclable/nonrecyclable) is important to speed up the solid collection process and increase the amount of waste, particularly plastics, recycled. It also promotes composting of kitchen and green waste, which prevents the generation of methane, a potent GHG. Overall, source separation reduces the amount of waste that goes to landfill, thus decreasing waste disposal costs.

Lack of awareness and knowledge on waste separation: The main reason for not sorting waste by households in Lagos State is lack of awareness and information. The household survey data suggest that 42 percent of sample households had never sorted their waste before, 41 percent stated that they do not have time to sort, 20 percent reported that they do not know why they should sort waste, and 8 percent reported that they do not know or remember how to sort.⁸ The data also show that 91 percent of the households did not receive any information related to waste; only 9 percent reported having received information.

Excessive use of plastic for packaging: Most households in Lagos State consume takeaway food regularly. Most of the takeaway food is packed and carried in containers made from plastic and polystyrene (PS). PS is difficult to recycle and more harmful to the environment than standard plastic.⁹ Plastic shopping bags are also used indiscriminately with stores providing multiple bags to shoppers at no cost. The endemic use of ‘pure water’ packaged in plastic sachets by households across socioeconomic levels in both rural and urban areas also contributes to excessive use of plastic packaging in the country.

Gap in capacity: There is a gap in knowledge and technical expertise across both government and private sector personnel in the entire waste management value chain which stems from poor investment in capacity building and modern work tools. To drive innovation and promote the domestication of waste management technologies, rather than importing, it is crucial to build capacity and knowledge of best practices in the sector through adequate funding and knowledge transfer.

Gap in data collection, documentation, accessibility: Lagos State needs to improve its data collection, documentation, and accessibility in data analysis for effective waste management policies. The state’s failure to reactivate or replace the weighbridges long since abandoned at dumpsites has meant that the volume of waste disposed of at these sites cannot be ascertained, leading to a reliance on random estimates. There are some data-sharing platforms such as PAKAM, CitiMonitor, and LAWMA; however, the available data are conflicting and unreliable and not all companies are willing to share their waste management performance. However, LAWMA has established a data-sharing relationship with some aggregators, and the PAKAM app is a good start for effective data management. There is also a data gap on recyclables taken from dumpsites,

⁸ Some households reported multiple reasons for not sorting waste.

⁹ For more information on recycling of polystyrene, visit the website of Conserve Energy Future at <https://www.conserve-energy-future.com/is-styrofoam-recyclable.php>.

and incentivizing aggregators to share data on a central platform can help track the quantity of recyclables collected. Moreover, data on recyclable waste from households, wastebins, trucks, or dumpsites that go through the informal system are not adequately quantified and captured.

Gap in public engagement and participation: There is still a need to improve awareness about MSW and recycling across the state, and the state government has taken several initiatives to engage the public and increase awareness on these topics. These initiatives aim to improve source segregation, reduce littering, and waste generation. However, the impact of these efforts is undermined by the lack of segregated wastebins in most households. A survey carried out in 2020 found that the public's perception of the government's efforts was average, and many respondents were aware that sorting waste at source could improve material recovery. While some felt unable to institute the practice on their own, waste collection fees were acceptable to the public.

1.1.3 Recommendations

Recommendations to improve the MSW sector in Lagos State are listed below:

Waste sorting bins and training: Provision of separate color-coded wastebins that can be used for sorting is urgently needed. Deployment of standardized wastebins should be prioritized by the state government and subsidized for low-income areas with a gradual repayment plan to encourage adoption. This is critical because, currently, the number of wastebins owned by households in Lagos State is only about 1.4 percent, which includes a bag, a cardboard box, a dustbin, or a bucket.

Improve coverage of MSW services: Figure 1.4 above suggests that solid waste generated by about 16 percent of the population of Lagos State (equivalent to 3.9 million people) is left uncollected—it ends up in the street, rivers, drainage systems, and the ocean. Provision of access to formal solid waste collection to this section of the population is critical to reduce the adverse health and environmental consequences of mismanaged waste. About 35 percent of the sample households are willing to pay up to ₦1,245 more per month for improved SWM, and this can offer more resources for improving waste collection and processing. Households' willingness to pay for improved SWM is likely to increase after information and awareness raising campaigns.

A shift in the MSW model: Municipal waste management in Nigeria in general, and Lagos State in particular, urgently needs a shift from 'waste disposal' to 'waste preparing for reuse and recycling'. This involves moving up in the 'solid waste hierarchy' adopted by the European Union. Such a shift is achieved through a set of legislations and investment in the MSW system. To this end, there is scope for involvement of a few large-scale private sector managers with capacity to deploy the funding, expertise, and technology required to manage modern waste collection and treatment facilities in a megacity such as Lagos, and they must effectively integrate existing PSPs and informal operators, including cart pushers, in their value chains.

Household awareness campaigns: Solid waste can be reduced by raising the awareness of households on the health and environmental impacts of mismanaged waste, the responsibility of each citizen in reducing his/her ecological footprint, and sustainable lifestyle choices. These awareness initiatives should also be a part of the school's curriculum to shift the consumption patterns, resource use, and waste generation behavior of future generations.¹⁰

¹⁰ A report by the Swedish Foundation for Strategic Environmental Research (Mistra) on sustainable consumption presents 62 ways of enabling sustainable consumption, is a useful toolbox with examples of governance and change toward sustainable consumption. Visit the official website of One Planet Network for more information: <https://www.sustainableconsumption.se/wp-content/uploads/sites/34/2022/05/62-ways-of-enabling-2022.pdf>.

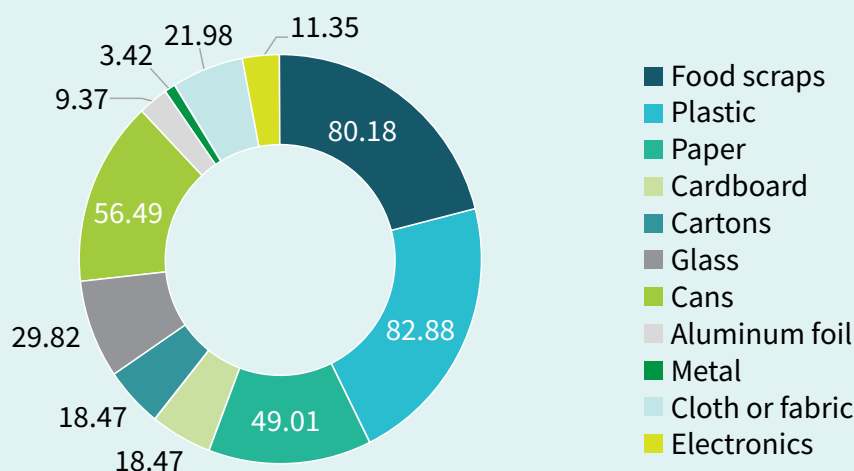
BOX 1.3 CURRENT STATE OF SOLID WASTE GENERATION AND DISPOSAL IN LAGOS STATE—HOUSEHOLD SURVEY

For a better understanding of household-level solid and plastic waste consumption and disposal in Lagos State, a household survey with a representative sample of 1,110 households recruited from 10 local government areas (LGAs) was conducted in February 2023. A detailed description of the sampling and key descriptive statistics of the sample households is presented in section 4.2.2.

A large proportion of households (57 percent) purchase food as needed, 25 percent of the households shop food once a week, and about 12.4 percent shop twice per week. Shopping for food items is one of the leading generators of plastic waste in the world in general, and in Nigeria in particular. A recent study shows that approximately 80 percent of water pollution worldwide is caused by plastic bags (Suleman et al. 2022). The scale of plastic products consumption is evident from the household data, which indicates that about 56 percent of the sampled households purchased takeaway food during last week, which is packed with PS containers and carried in plastic bags.

Understanding what type of waste households generate is important to formulate policies aiming at altering household consumption and waste generation behavior. Information on what type of waste is generated by households is reported in figure B1.3.1. All the top five types of waste reported by households—plastic waste (83 percent), food scraps (80 percent), cans (56 percent), paper (49 percent), and glass (30 percent)—are recyclable.

Figure B1.3.1 Waste composition at the household level (%)



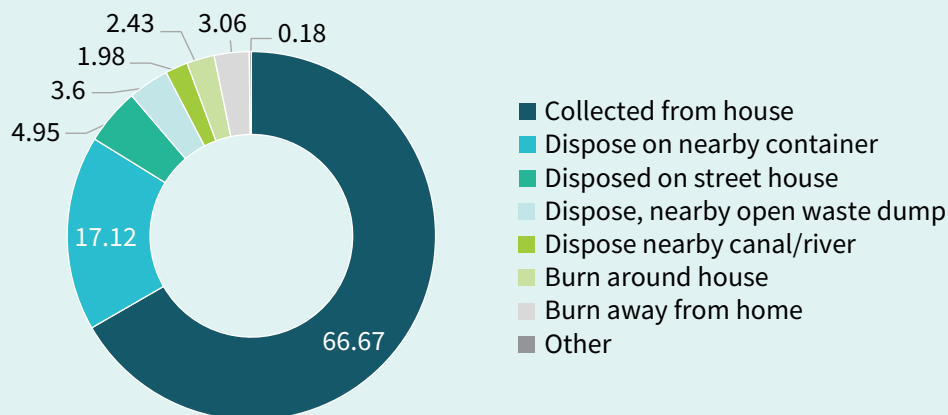
Note: In the survey, the respondents were asked the following questions: “In the last seven days, which of the following trash or refuse did the household consume and dispose?” The percentage shares are not expected to add up to 100, because a household could potentially generate all the different types of waste, which is the case.

Figure B1.3.2 presents information on how waste is disposed of. Almost 67 percent of households get waste collected from their house and 17 percent dispose of in a nearby container. The remaining 16 percent of households dispose of on the street near their house, a nearby open dumpsite, or canal/river or burn their waste. Although the proportion of households disposing of waste openly or

BOX 1.3 CURRENT STATE OF SOLID WASTE GENERATION AND DISPOSAL IN LAGOS STATE—HOUSEHOLD SURVEY (contd.)

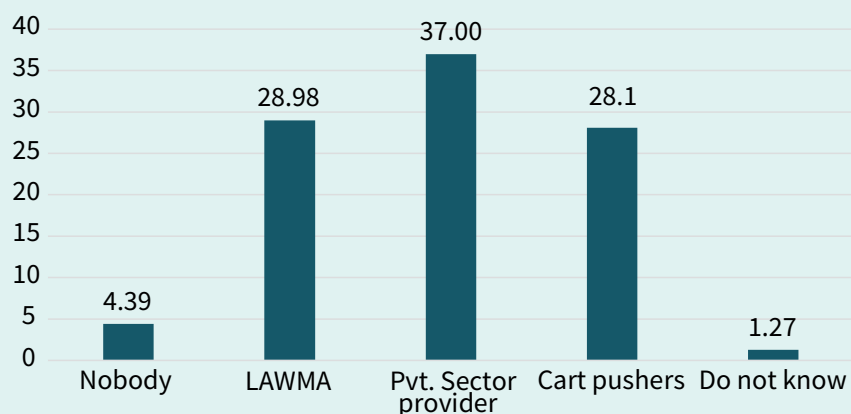
burning seem to be low, the magnitude of mismanaged waste is significant, that is, waste generated by approximately 3.9 million people is mismanaged and ends up on the street or in rivers, drainage systems, and the ocean.

Figure B1.3.2 Proportion of households using different solid waste disposal facilities (%)



Information on who collects solid waste in Lagos State and how often it is presented in figures B1.3.3 and B1.3.4, respectively. Compared to the rest of Nigeria, there is a significantly larger involvement of the private sector in waste collection in Lagos State. Figure B1.3.3 suggests that only 29 percent of solid waste is collected by LAWMA, but the figure is 37 percent for private sector providers and 28 percent for cart pushers. Thus, 65 percent of households dispose of solid waste through the private sector, a figure that exceeds the national average by 60 percentage points. Figure B1.3.4 shows that waste for most households (58 percent) is collected once a week, 24 percent collected at no regular interval, about 9 percent is collected twice a week.

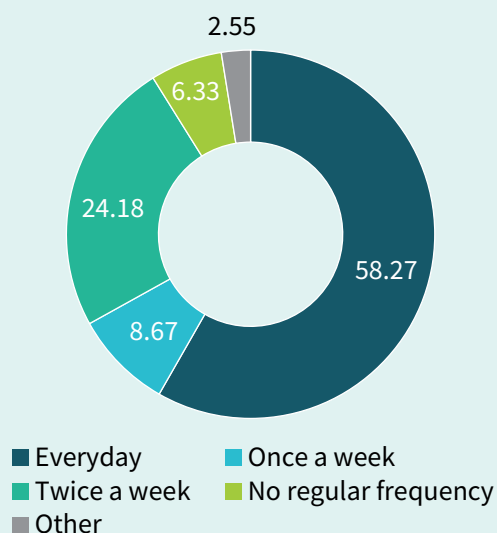
Figure B1.3.3 Household waste collection (%)



Note: LAWMA = Lagos Waste Management Authority.

BOX 1.3 CURRENT STATE OF SOLID WASTE GENERATION AND DISPOSAL IN LAGOS STATE—HOUSEHOLD SURVEY (contd.)

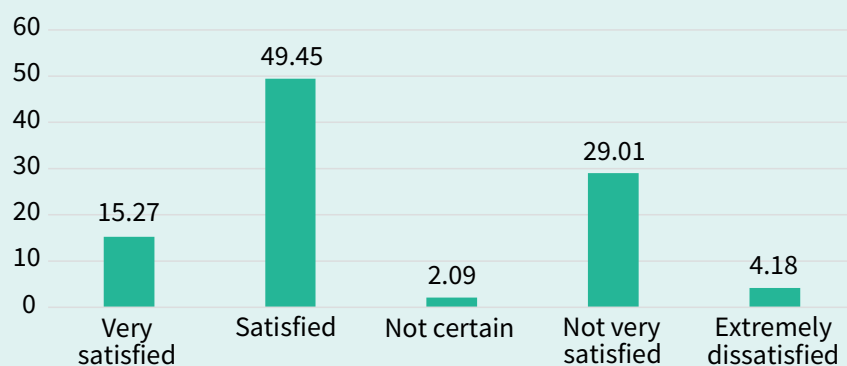
Figure B1.3.4 Frequency of waste collection (%)



An important source of finance to cover the cost of waste collection is the fee collected from households. About 92 percent of households whose waste is collected are charged a fee for the service. The current average monthly fee charged to households, computed by converting the payments made at different intervals, is ₦1,100.

Finally, households in Lagos State were asked how satisfied they are with the current waste collection service. About 50 percent of the sample households have reported to be satisfied and 15 percent are very satisfied. However, a sizeable proportion of households (29 percent) reported not to be very satisfied by the solid waste collection service and another 4 percent to be extremely dissatisfied. One-third of the households are therefore either not very satisfied or extremely dissatisfied, which suggests room for improvement of the SWM service in the state, as shown in figure B1.3.5.

Figure B1.3.5 Satisfaction in waste collection service (%)



Additional facts on household solid waste and plastics generation in Lagos State are as follows:

- **Frequency of consumption of takeaway food:** About 56 percent of households bought takeaway food during the week preceding the survey, mostly packed with polystyrene (PS) and carried in plastic bags.
- **Usage of nylon bags are used:** About 62 percent of households discard nylon bags, 33 percent reuse them as carry bags, 19 percent reuse them for storage, and 16 percent reuse them in waste.
- **Daily waste generation generated:** Households on average generate 1.11 bags of waste per day.

BOX 1.3 CURRENT STATE OF SOLID WASTE GENERATION AND DISPOSAL IN LAGOS STATE–HOUSEHOLD SURVEY (contd.)

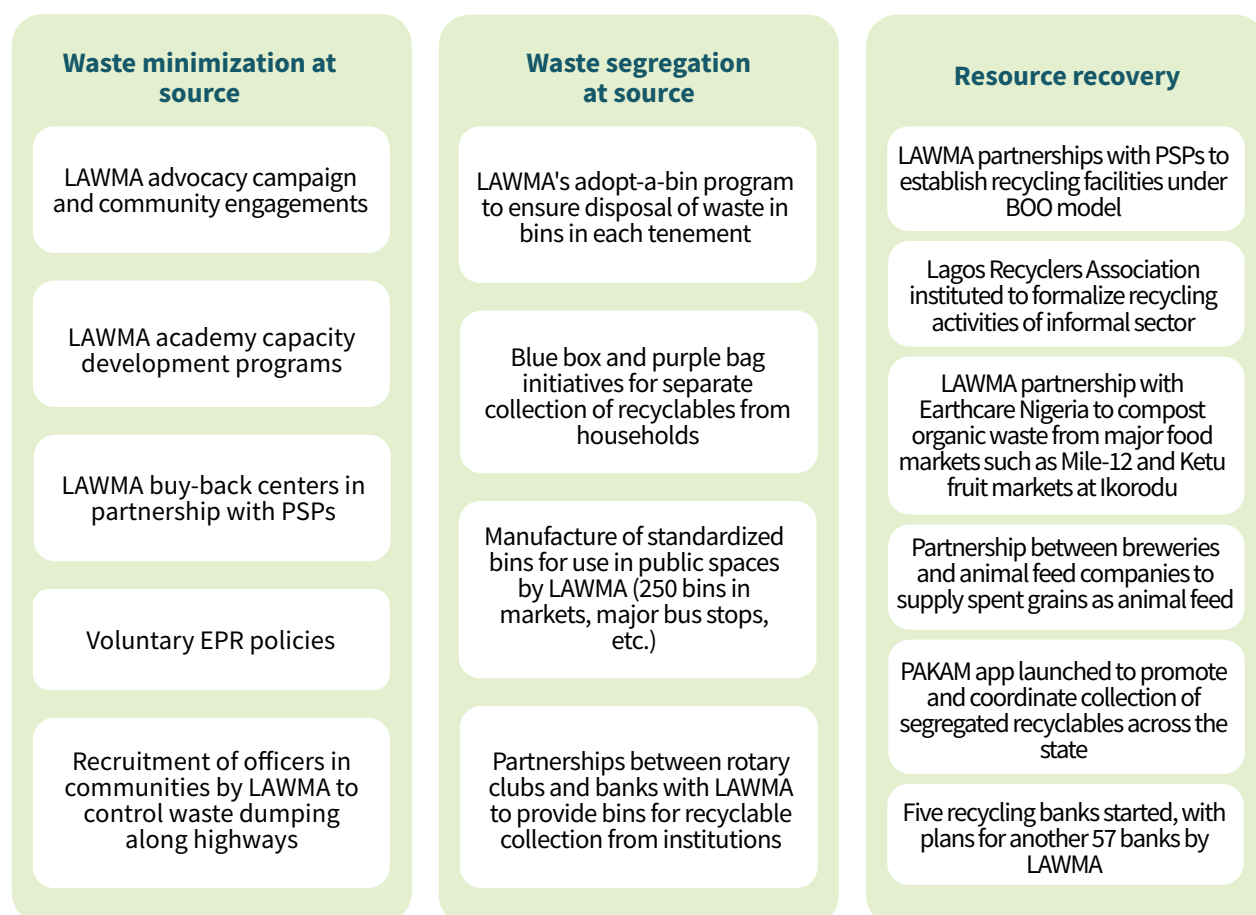
- **Number of waste containers owned by households:** The average household on average owns 1.42 containers of waste.
- **Payment of waste collection fee:** About 64 percent of households pay waste collection fee monthly, 23 percent pay weekly, 4 percent pay every two weeks, and only five percent pay twice or more per week.

Source: World Bank 2024b (internal report).

1.1.4 Current Waste Management Practices

Current practices to manage solid waste in Lagos State have been categorized into various stages of the waste management value chain, as summarized in figure 1.5.

Figure 1.5 Summary of current waste management practices in Lagos



Source: World Bank.

Note: BOO = build, operate, own, EPR = extended producer responsibility, LAWMA = Lagos Waste Management Authority, PSP = private sector partnership.

Interest in the development of local technologies to manage waste effectively is increasing and can be evidenced through the introduction of initiatives such as the following:

- Electronic bin trackers have been installed on the 100 newly constructed double-dino bins to monitor their locations and movements.
- Lagos State partnered with Dangote Sino Trucks to assemble a Made-in-Nigeria compactor truck; these trucks are locally assembled, and therefore any breakdown can be easily handled since LAWMA engineers are part of the assembly team in Nigeria.
- Two smokeless incinerators for treating medical waste have been set up in Lagos State through collaboration with the private sector and the University of Ibadan, and there are plans to set up similar facilities to meet the state's medical waste disposal needs.

1.2 SWM POLICIES AND INSTITUTIONAL STRUCTURE IN LAGOS STATE

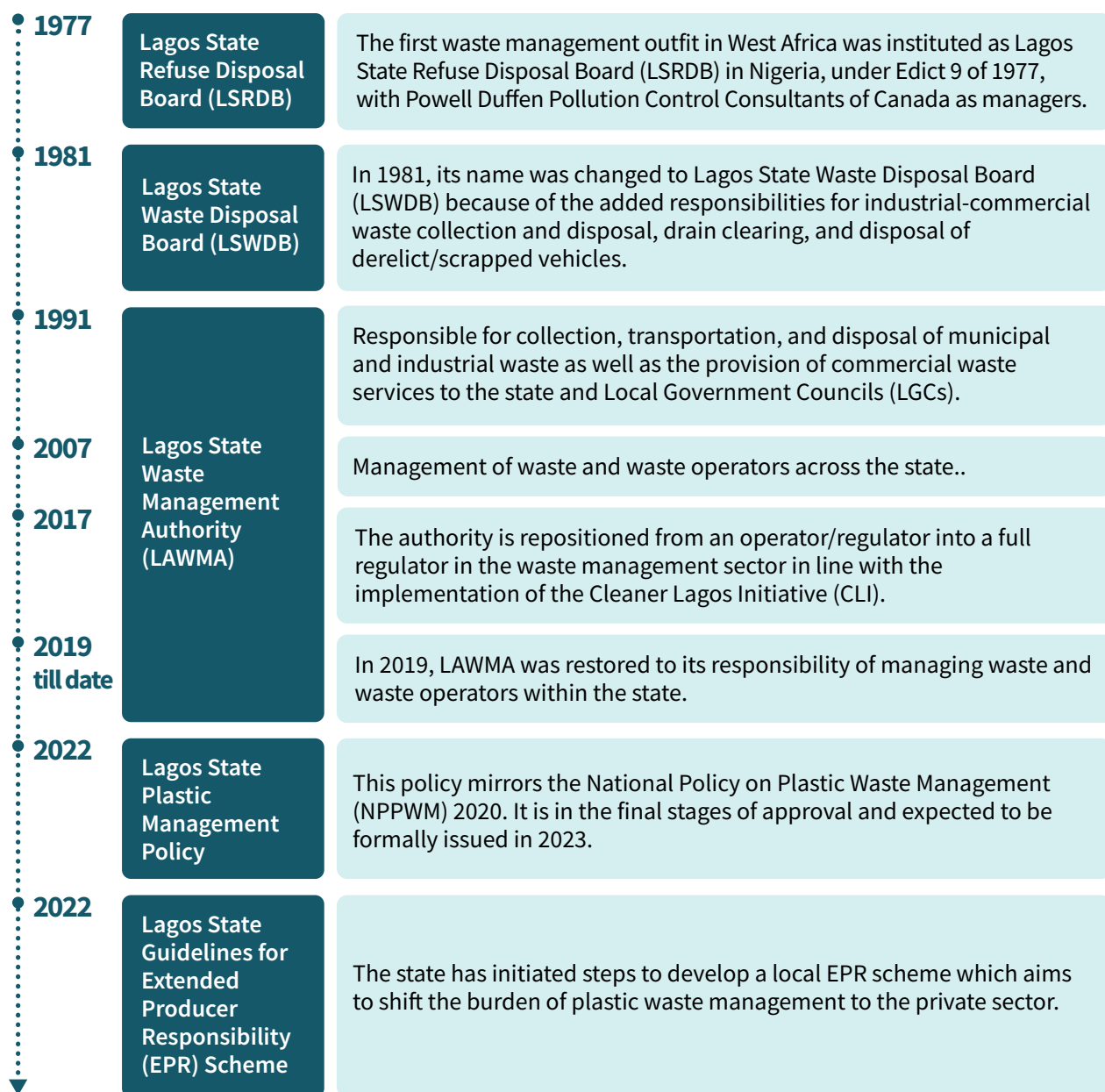
Section 1.2.1 and 1.2.2 discuss the policy and institutional landscape for MSW in Lagos State, followed by the challenges in establishing and implementing relevant waste-related policies in the state in section 1.2.3. Finally, section 1.2.4 provides recommendations on improving waste-related policies, institutions, and coordination for the State.

1.2.1 Current Institutional Status

Nigeria has a three-level federal structure comprising the federal government, 36 state governments, and 774 LGCs. The Federal Capital Territory (FCT), Abuja, is an autonomous entity administered by the FCT Administration and headed by the Minister of the FCT. The management of solid waste in Nigeria is a shared responsibility among the three tiers of government, as included on the Concurrent List of the Constitution. The federal government, through the Federal Ministry of Environment (FMEnv) and its regulatory agency, the National Environmental Standards and Regulations Enforcement Agency (NESREA), sets the national policy and regulatory frameworks for environmental and municipal solid waste, while local policies, regulations, and operational responsibilities are decentralized across the 36 states and the FCT.

LAWMA is the government agency responsible for regulating and managing solid waste and waste operators in Lagos State. It oversees private sector operations as well as collects and disposes of waste from public spaces such as highways, major roads, and traditional markets (Olukanni and Oresanya 2018). LAWMA aligns its activities with the federal-level guidance provided by the FMEnv and the NESREA. A timeline providing a brief evolution of the state's MSW journey is shown in figure 1.6.

Figure 1.6 Timeline of Lagos State MSW activities



Source: Adapted from UNIDO 2021.

NESREA acts as an economic regulator in Nigeria, a fully empowered authority providing advice to the government on national environmental strategy and legislation. NESREA is tasked with ensuring equitable access to public utilities, promoting infrastructure investment, and protecting market neutrality through reporting progress on the *National Policy on Solid Waste Management* (NPSWM) 2018 and safeguarding the public's right to a clean environment.

1.2.2 Current Status of Solid Waste Management Policies

Section 20 of the Constitution of the Federal Republic of Nigeria (as amended in 1999) empowers the state to protect and improve the environment and safeguard the water, air, land, forests, and wildlife of Nigeria. Environmental management and protection are concurrent issues; the FMEnv creates and enforces environmental laws in Nigeria, while each state may set up its own environmental protection body and create laws (bylaws in the case of LGCs) relevant within its jurisdiction.

The federal and state governments in Nigeria have enacted laws, regulations, policies, and guidelines to address various aspects and types of waste within their jurisdictions. A timeline of these policies and regulations is shown in figure 1.7. Although there is a comprehensive NPSWM, more work is needed to operationalize the policy effectively at the state level.

Figure 1.7 Timeline of key policies and regulations related to MSW in Nigeria

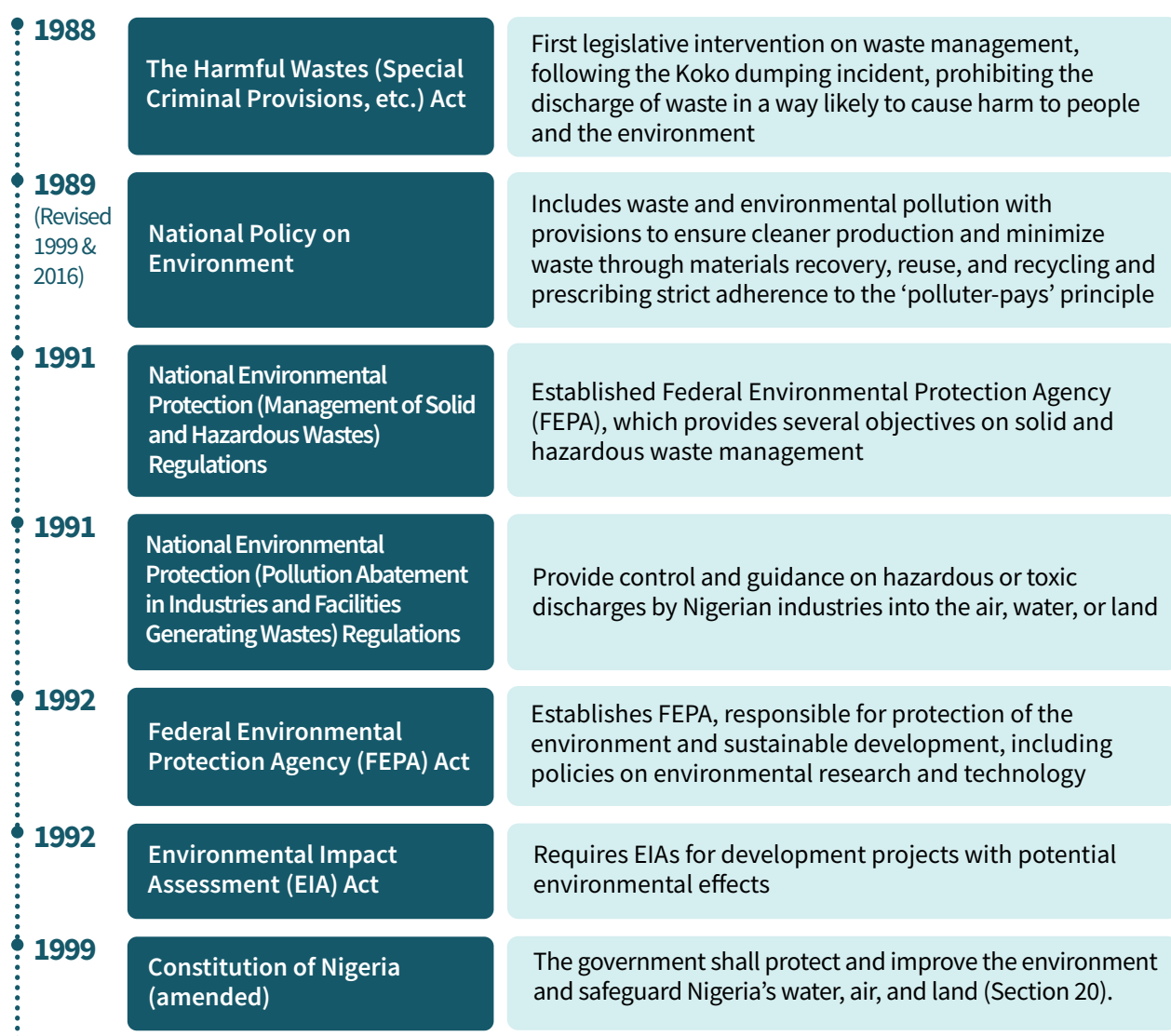
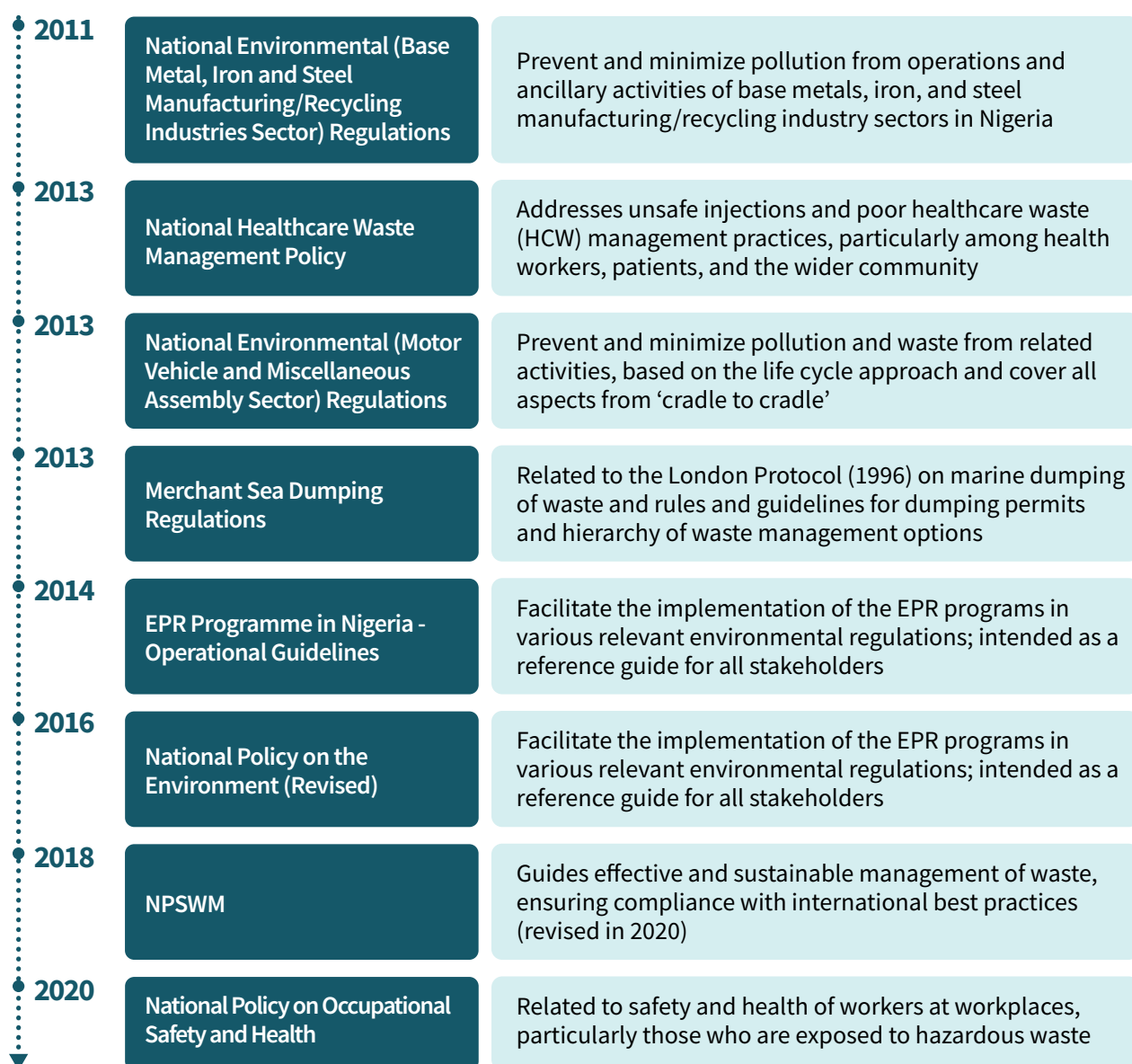


Figure 1.7 Timeline of key policies and regulations related to MSW in Nigeria (contd.)

2002	Environmental Guidelines and Standards for the Petroleum Industry in Nigeria - 1991 (revised in 2002)	Standards for environmental pollution abatement and monitoring procedures
2005	Policy Guidelines on Solid Waste Management	Explains how MSW should be organized, responsible organizations, stakeholder roles with emphasis on the private sector to improve public health through efficient MSW methods
2007	NESREA Act	Principal legislation on environmental protection in Nigeria, which established NESREA to replace FEPA
2007	Nigerian Maritime and Safety Administration (NIMASA) Act	Established NIMASA with the responsibility to regulate and prevent marine pollution
2007	Merchant Shipping Act	Makes provisions for preventing pollution from ships, including the application of specific international conventions and agreements
2009	National Environmental (Sanitation and Wastes control) Regulations	Relate to specific environmental issues and several categories of waste, with reference to end of life, hazardous, healthcare, industrial, solid, and packaging waste, among others
2009	National Environmental (Food, Beverages, and Tobacco Sector) Regulations	Prevent and minimize pollution from operations and ancillary activities from food, beverage, and tobacco companies
2009	National Environmental (Chemicals, Pharmaceuticals, Soap, and Detergent Manufacturing Industries) Regulations	Prevent and minimize pollution from operations and ancillary activities from pharmaceutical, soap, and detergent manufacturing industries
2011	National Environmental (Domestic and Industrial Plastic, Rubber and Foam Sector) Regulations	Prevent and minimize pollution from operations and ancillary activities of the domestic and industrial plastic, rubber, and foam sectors
2011	National Environmental (Construction Sector) Regulations	Prevent and minimize pollution from construction, decommissioning, and demolition activities and compliance with duty of care concerning generation, transportation, and disposal of waste
2011	National Environmental (Electrical/Electronic Sector) Regulations	Prevent and minimize pollution from operations and ancillary activities of the electrical and electronic sector, based on a life cycle approach and cover all aspects from 'cradle to grave'

Figure 1.7 Timeline of key policies and regulations related to MSW in Nigeria (contd.)



Note: EPR = extended producer responsibility, MSW = municipal solid waste, NESREA = National Environmental Standards Regulations and Enforcement Agency.

1.2.3 Challenges

Although the solid waste sector in Lagos State faces some challenges, such as insufficient financing (currently less than \$2 per person per year), poor enforcement of policies, policy inconsistency, or lack of continuity of policies, positive steps are being taken at both national and Lagos State levels to address these issues. For instance, an overlap of mandates across different levels of government has been identified as a constraint in the NPSWM 2018, along with the need to improve cooperation among waste management regulators, who often work independently. A positive development has been the unveiling of the Lagos State Plastic Waste Management Policy at a stakeholder forum in November 2022. A summary of challenges is included below:

- **The legislative and de facto institutional framework for enforcement of waste control regulations in Lagos State:** Objectives regarding SWM remain unachieved, such as enforcing waste separation and universal collection coverage and treatment. The legal framework for enforcement is inadequate and does not reflect the SWM limitations on the ground. For example, mismanaged plastic bags are a big issue in Lagos State and nationally, yet there are no enforceable laws to regulate the excessive use of the bags. A ‘Plastic Bags Prohibition Bill’ seeking to interdict the use, manufacture, and importation of all plastic bags with harsh penalties was presented to the national assembly in 2018 but has not yet been passed. The proposed bill is thus a punitive legislative ban that may be impossible to enforce as no proactive measures were included, such as alternatives replacing plastic bags. The same applies to illegal disposal in deprived areas: enforcing regulations is ineffective as bins or containers are not available, leading to littering and illegal disposal in authorized sites.
- **Equity aspects:** Enforcing extended producer responsibility (EPR) is crucial to increase private SWM financing across Nigeria. However, this instrument, created in 2014 by the national environment regulator NESREA, has not been enforced by the government, thus perpetuating fundamental financing constraints to waste collection and the recycling industry. As a result, the Lagos State Government recently initiated measures to create an EPR regulation that it can enforce in the state—a move that NESREA seems to oppose. Another equity gap is evidenced with LAWMA’s program ‘Buy LAWMA Bin’. All households are legally required to have appropriate containers for waste, promoting the regular removal of the waste by paid service providers. This is seen as part of enforcing regulations by LAWMA and generating revenue. However, the bins cost ₦50,000 (over \$100) each, which is not affordable to most of the Lagos population, where the national minimum wage is ₦30,000 per month. ‘Buy LAWMA Bin’ legal requirements, and the inability to enforce them, discredit authorities and this leads to program failure.
- **Resources available to the enforcing agencies:** The budgetary allocations and human resources for enforcement are hard to track, indicating that there is a need for better recordkeeping. Lagos State currently has 865 Sanitation Corps/Kick Against Indiscipline (KAI) officers, that is a ratio of less than 4 officers to 100,000 residents. However, no report has mentioned the effectiveness of such agents, qualifying their work in terms of ability to enforce laws and improve SWM by reducing unlawful activities such as illegal disposal. Following the request for information using a questionnaire, the Ministry of Environment and Water Resources noted that about 800 cases have been reported to the mobile sanitation courts.
- **Waste collection coverage:** Although LAWMA reports 63 percent waste collection coverage in the state, the scope of coverage by private operators is hard to track as no accurate data are available. Enforcing waste collection contracts with PSPs, increasing compliance, and verifying any illegal waste disposal are of utmost importance; however, reporting from LAWMA is not available, resulting in a transparency gap.
- **Monitoring:** Lagos State Environmental Protection Agency (LASEPA) conducts inspections and monitors waste management facilities and illegal activities regarding hazardous waste mismanagement. It also operates its own chemical waste management facility (The Guardian 2022). Additionally, LASEPA is involved in creating awareness campaigns to educate the public about the importance of proper waste disposal and management. However, information is scarce on the results of the enforcement practices.

1.2.4 Recommendations

The establishment of LAWMA has brought about some positive changes in MSW operations, and recent progressive initiatives, such as providing land and guarantees to the proposed plastic waste aggregation hub of the Food and Beverage Recycling Alliance (FBRA), as described in box 1.4, demonstrate the state government's commitment to tackling MSW issues. The following recommendations are proposed to improve the policy and institutional structure in Lagos State:

- **Update guidelines to enhance compliance with existing laws and improved enforcement**
- **Strengthen monitoring mechanisms**
- **Work with the informal sector as a key stakeholder while at the same time focusing on improvements in the formal waste management system, as the informal sector plays a crucial role in MSW services and activities.** For instance, the government could clarify the restrictions on informal waste workers, such as a ban on cart pushers and wheelbarrow operators, put forth in the CLI.
- **Engage a few experienced, large-scale private waste management companies with capacity to fund and operate modern waste collection and treatment operations to complement the efforts by LAWMA and the PSPs.**

BOX 1.4 THE FOOD AND BEVERAGE RECYCLING ALLIANCE (FBRA)

The Food and Beverage Recycling Alliance (FBRA) is a packaging producer responsibility organization (PRO), mandated by National Environmental Standards Regulations and Enforcement Agency (NESREA), consisting of a coalition of companies in the food and beverage sector in Nigeria. The 29 members of FBRA are committed to improving collection and recycling of post-consumer packaging waste, including PET bottles, used beverage cartons, aluminum cans, glass, and flexible plastics. FBRA focuses on the following three main areas:

- Enabling collection and recycling through partnerships across 11 states in Nigeria. FBRA has collected 28,000 MT of PET, 1,000 MT of used beverage cans, 2,000 MT of flexibles, and 56 MT of glass.
- Ensuring engagement and thought leadership: FBRA codeveloped the rPET standard that is approved by the Standard Organization of Nigeria (SON). It engages with partners such as the World Bank to strengthen EPR in the packaging sector.
- Creating public awareness in over 100 communities across the country and through its work on school advocacy programs to promote responsible disposal and take-back of post-consumer packaging waste.

FBRA was formed in 2013 and incorporated in 2018. While it does not yet function as a full-fledged PRO, it uses financial contributions on members to support advocacy and cleanup campaigns as well as the collection and recycling of packaging waste, as a precursor role of a PRO, and aspires to South Africa's Petco PRO model that effectively manages its own generated waste.

Note: For more information on FBRA, visit the official website at <https://www.fbranigeria.ng/>

1.3 PRIVATE SECTOR PARTICIPATION

LAWMA enlisted the services of private companies for waste collection, transportation, and appropriate billing of waste services. The PPP waste management structure consists of commercial and domestic operations. Each contractor caters to a varying number of houses in a particular service area, and the waste user fees charged by the operator are approved by LAWMA. The agency operates two PSP engagement models: a contract model (LAWMA collects the user fees and pays an agreed rate of commission to the operator) and the franchise model (the operator collects the charges and remits an agreed fee to LAWMA). Most franchise operators in low-income areas find it challenging to collect the charges and therefore are pushing to get on to the contract model. Collection of waste and revenue in some locations such as public markets are handled directly by LAWMA.¹¹ Private operators dispose of collected waste at LAWMA-operated transfer stations and dumpsites in Lagos State.¹²

The private sector has played a significant role in the management of waste in Nigeria, by increasing service coverage, investing in the sector, and creating opportunities for employment and revenue generation through resource recovery. The fleet of waste collection trucks from the private sector exceeds the number owned by the state government. Of the 920 waste collection trucks in Lagos State, less than 300 are owned by the government, while the remaining are from private companies. LAWMA collects waste from public spaces; private companies collect it from residential, institutional, commercial, and industrial entities through door-to-door collection. Hence, the private sector collects approximately 75 percent of the total waste in Lagos State (Olukanni and Oresanya 2018). In resource recovery and recycling, over 90 percent of activities are carried out by the private sector, while the state government only provides an enabling environment with minimal operations.

1.3.1 Challenges and Recommendations for Private Sector Participation

Table 1.1 summarizes the various challenges faced by the private sector in MSW in Lagos State. It also provides recommendations to overcome these challenges.

Table 1.1 Challenges and recommendations for private sector participation in MSW in Lagos State

Activity	Present situation	Challenges	Recommendations
PSP model reliant on SMEs	LAWMA adopts a combination of PSP models and own services in waste collection and management	- Waste collection not extended, improvement required mostly in low-income and rural areas - Limited operating capital and capacity for waste treatment - Large number of PSPs makes standardization and coordination difficult	- Harmonize the dual PSP engagement framework by standardizing to the contract model that guarantees steady revenue for operators. - Increase MSW funding by charging cost-reflective tariffs and increasing enforcement effectiveness

¹¹ World Bank 2024b (internal report).

¹² For more information on private sector partnerships, visit the official LAWMA website at <https://lawma.gov.ng/psp/>.

Table 1.1 Challenges and recommendations for private sector participation in MSW in Lagos State (contd.)

Activity	Present situation	Challenges	Recommendations
Funding	Overreliance on public revenue with the government responsible for about 70% of SWM funding, including guarantees to banks for lending to PSPs	- Poor monitoring of funding and its effectiveness to enhance further collection coverage - Low private sector investment in scaled waste collection and treatment infrastructure	- Attract and award PSP contracts to capable operators with adequate resources - Have a clearly defined funding scheme for the PSP operators.
Bins in homes	Wastebins not available in households, including some parts of the perceived elite island district	Low rate of wastebin deployment with little or no waste segregation	Make it compulsory for every household to install the standardized wastebins to improve waste handling/segregation and collection which would improve PSP collection efficiency
Infrastructure and equipment	The current waste management infrastructure requires more efficient equipment. Only smaller size trucks and vehicles can access unplanned areas	Landfills are nonexistent, and transfer loading stations, recycling plants, and compactor trucks are not adequate	- More transfer loading stations are needed - Management of dumpsites should be improved, and the state should facilitate private sector investment in mechanized sanitary landfill
Transparency	LAWMA publications to boost awareness on how PSPs perform	Trustworthiness affected by the lack of a robust information system	Publish the annual accounts of investment and operational plans within the PSP performance

Source: World Bank.

Note: LAWMA = Lagos Waste Management Authority, PSP = private sector partnership, SMEs = small and medium enterprises, SWM = solid waste management.

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CHAPTER 2

PLASTIC WASTE MANAGEMENT IN LAGOS STATE



Nigeria's demand for plastics is increasing rapidly—over the last decade per person plastic consumption grew 6 percent annually. As domestic plastic consumption has outpaced production, the country imports 70 percent of its needs and is a leader in plastic raw materials imports in Africa. At the same time, Nigeria is also the biggest generator of plastic waste in Africa, estimated at 1.5 million metric tons (MT) in 2017. From 2010–20, the per person consumption of plastic in Nigeria grew by 4.81 percent and was estimated to reach 7.4 kg in 2020 from 6.5 kg in 2017, due to increasing demand for packaging, electrical and electronics, and automotive industries. Single-use plastics (SUPs) are widely used in Nigeria for their convenience and several other factors. Approximately 70 percent of Nigerians are said to consume and dispose of at least one plastic sachet of drinking water daily, given the limited access to municipal water supply.

As the country's leadership recognizes the need for a circular economy for plastics, it is crucial to understand the plastic waste management system. The plastic value chain at the national level is discussed in topic sheet 2. Weak implementation of existing policies at the national level, mismanagement of municipal solid waste (MSW) systems at the local level, and negative behavior related to managing waste have resulted in a serious plastic pollution problem for the country.

Plastic waste is also a significant environmental issue in Lagos State. High population density and rapid urbanization have led to an increase in plastic waste generation, which has become a major challenge for the state.

One of the main sources of plastic waste in Lagos State is SUPs, such as plastic shopping bags, water sachets, and straws. These items are discarded after a single use and often end up in the environment, clogging drains, and causing flooding during the rainy season. The accumulation of plastic waste also poses health risks to the population, as it can attract disease-carrying insects and rodents. Land-based plastics leaking into the marine environment, such as from the Nigerian coast, disintegrate into microplastics and can adversely affect human health through the consumption of seafood.

This chapter aims to provide a comprehensive overview of the existing conditions on plastic waste management in Lagos State in section 2.1. Section 2.2 summarizes the institutional structure related to plastics in the state as well as related policies at the national level. The importance and need to transition from a linear 'take-make-waste' economy to a circular economy, through reuse, recycling, refurbishing, and regeneration of natural resources, is discussed in section 2.3.

2.1 PLASTIC WASTE LANDSCAPE IN LAGOS STATE

Section 2.1.1 describes the plastic waste management landscape in Lagos State, followed by a summary of the various related challenges in section 2.1.2. Section 2.1.3 provides recommendations on improving plastic waste management in the state. A summary of the plastic waste flows in Lagos State is provided in figure 2.1.

Figure 2.1 Flow of plastic waste in Lagos State

Collection–20% 598 TPD			Disposal–2,990 TPD	
Plastic waste generation 23% of 13,000 TPD = 2,990 TPD = 45 kg/inhabitants/year Population: 24,000,000	Informal + formal collection (estimated)	17.3% 518 TPD	Dumpsite Collected plastic waste with the residual waste (estimated)	33% 879 TPD
	Collected by service providers - FBRA reports	2.6% 77 TPD	Managed plastic waste Informal + Formal (non-registered) + FBRA + LAWMA	20% 598 TPD
	Collected by LAWMA - community centres	0.1% 4 TPD		
	Uncollected (estimated)	80% 2,392 TPD	Unmanaged plastic waste Burning, dumping, etc.	40% 1,205 TPD
			Plastic waste ending up in water	7% 200 TPD

Source: Original calculations for this publication.

Note: “Unmanaged plastic waste” refers to fractions of waste that are not dealt adequately within the MSWM system, making it difficult to estimate either the size of the problem or the scale of the associated costs. It consists of uncollected waste and waste that leaks out from the solid waste management system, both intentionally and non-intentionally, as well as illegally dumped waste in the environment (WFD Manual 2020). FBRA = Food and Beverage Recycling Alliance, LAWMA = Lagos Waste Management Authority, TPD = tonnes per day.

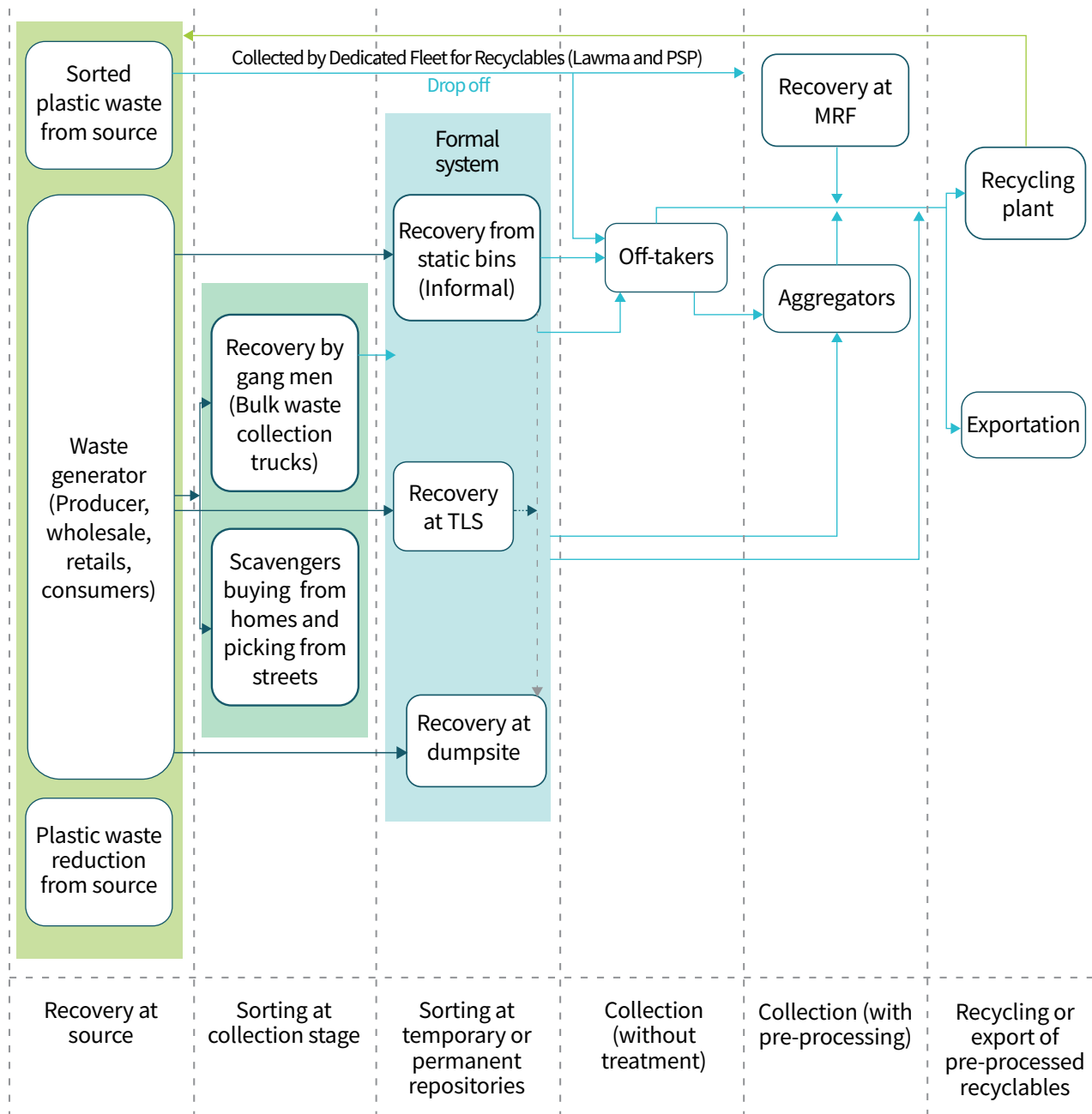
2.1.1 Current Status

2.1.1.1 Plastic Waste Generation

Plastic waste constitutes 15–23 percent of the 4.75 million MT of waste disposed of annually in Lagos State, leaving the state with at least 0.7 million MT of plastic waste, that is, 30 kg per person per year, which is four times the national average of 7.5 kg per person per year.¹³ The flow of both bulk (commingled) waste and the recycling process across the plastic waste value chain is shown in figure 2.2. Most of this plastic waste is not collected, and a sizable portion of the collected plastic waste is disposed of in dumpsites along with other wastes.

¹³ Plastic waste volume is calculated based on the assumption that 13,000 TPD of MSW is collected in Lagos State.

Figure 2.2 Flow of bulk waste and recyclables in Lagos State



COLLECTOR'S KEY

- > Flow of Bulk Waste
- > Flow of Recyclables
- > Flow of Recycled Product
- - -> Flow of Residual Waste

Source: World Bank 2024a.

Note: LAWMA = Lagos Waste Management Authority, MRF = material recovery facility, PSP = private sector partnership, TLS = transfer loading station.

2.1.1.2 Plastic Waste Characterization

In Lagos State, plastic waste of industrial and household origin, such as beverage containers and other packaging materials, makes up a significant portion of solid waste. A study on waste characterization carried out at the Olusosun dumpsite in 2022 revealed that plastic waste constitutes most of the waste disposed of in Lagos, at 29 percent, a higher value compared to previous studies. Plastic bags were found to be the largest subcategory of plastics at the dumpsite, at 40 percent, thus highlighting their poor recycling numbers. Other types of low-value and difficult-to-recycle plastics such as sachets, polyvinyl chloride (PVC), low density polyethylene (LDPE), and polystyrene (PS) made up another 45 percent.

2.1.1.3 Plastic Waste Collection

Following government efforts, the following actions were taken in Lagos State for plastic waste collection:

- **Source segregation:** As a result of the Lagos Waste Management Authority's (LAWMA) Blue Box Recycling Initiative (BBRI) launched in 2019 and the Lagos Recycle Initiative (LRI) in 2020, households have increased their efforts to separate waste into recyclable and nonrecyclable categories, using blue and black color-coded bags, respectively.
- **Recycling zones:** To ensure efficient collection of all recyclables, including plastics, the state has been divided into three separate recycling zones (west, central, and east), and each zone is assigned its own dedicated trucks.
- **Plastic banks:** The Lagos State Government has introduced plastic banks in markets, airports, and schools to collect plastic waste. These banks are made of wire mesh. Once filled, they are emptied by dedicated mini trucks from LAWMA, which can navigate across difficult terrains.
- **PAKAM app:** A real-time online service that connects waste generators of recyclable materials with recyclers and allows residents to separate plastic waste at source and request for pickup by dedicated trucks from LAWMA.
- **Community recycling centers (CRCs):** Blue boxes are placed in public areas where recyclable materials can be deposited. These recyclables are then picked up by either franchised recyclers or volunteer organizations and transported to the CRCs. In 2019–20, approximately 1,360 MT of recyclables were gathered at CRCs. Polyethylene terephthalate (PET) was collected in maximum quantity, followed by LDPE. Only a small portion was made up of metal and paper, indicating a substantial rise in plastic usage and a removal of high-value recyclable materials by the informal sector.
- **LAWMA's recycling brochure:** In 2020, LAWMA published *Lagos Recycle. Recycling Handbook. A Guide for Recycling Activities in Lagos State, Nigeria*.
- **Formal collection by registered recyclers:** Approximately 67 different private sector partnerships (PSPs) are officially registered with LAWMA to recycle waste. These PSPs recycle 60,000 MT of PET and 10,000 MT of polyethylene (PE) and polypropylene (PP) annually.
- **Informal collection:** A substantial part of plastic waste recovery in Lagos State is done by informal waste pickers who collect materials from dumpsites and wastebins. These individuals work together in associations to transport the sorted plastic waste to recycling facilities. However,

membership in these associations represents only a fraction of the total number of people involved in waste management in the state. Most waste collectors do not engage in organized waste sorting and recycling and instead operate within a limited scope of waste collection and evacuation to a dumpsite or transfer station.

2.1.1.4 Plastic Waste Treatment and Disposal

The recycling of plastic waste in Lagos State is increasing rapidly. Several small, medium, and large companies add value to plastic waste through pretreatment such as crushing and pelletizing or converting plastic waste into regular commodities such as shopping bags, hangers, chairs, and buckets. There is also a growing number of companies involved in high-value mechanical recycling, such as Alkem, which recycles PET waste into polyester staple fiber (PSF), Alef Recycling, which produces food-grade recycled polyethylene terephthalate (rPET) resins, and EngeePET, which is setting up a continuous polymerization plant. The material recovery facility (MRF), established through a public-private partnership (PPP) between the LAWMA and West Africa Energy, undertakes plastic recovery on a large scale.¹⁴ These companies, and others like them, should be encouraged through supportive government policies and initiatives.

A survey carried out by UNIDO to assess the ability of companies in the plastic ecosystem in Lagos to adapt to changes in their current business models showed that 95 percent of the companies would consider designing their products to increase collection and use alternative materials if regulation on extended producer responsibility (EPR) is imposed. The survey also found that most players in the plastic value chain are aware of bioplastics and want to know how it can improve their business performance. Moreover, these companies have a clear goal of improving their business outlook in line with global green economic practices and policies aimed at reducing plastic pollution, without adverse negative economic returns.

2.1.2 Challenges

Lagos State faces challenges related to plastic waste generation and management which need to be addressed, including:

- **High investment requirement:** Waste collectors and recycling businesses face several hurdles, including significant capital requirement, which can be as high as ₦500,000 for waste collectors not involved in processing. The number of employees, quantity of plastic waste collected, and revenue generated vary widely among private sector companies. Insufficient waste collection and sorting systems affect the volume of point-of-use recovery and therefore the quality and corresponding value of recycled plastics. Manual sorting by waste collectors is common because of difficulties in automating the process. Additionally, the 7.5 percent value-added tax (VAT) on plastics sold annually poses a challenge, particularly considering the low profit margins of waste collection businesses.
- **Access to funding and capacity:** Recyclers face challenges in accessing funding to deploy technologies in local communities and a shortage of local capacity for chemical and laboratory

¹⁴ This information was confirmed during a stakeholder engagement session with the Managing Director of LAWMA, Mr. Ibrahim Odumboni on September 1, 2021. For more information on the MRF, visit the official website of West Africa Enrg (accessed September 5, 2023), <http://www.westafricaenrg.com/en/case-studies/>.

analysis, which requires shipping samples overseas. The competitiveness of recycled resin is also affected by the inconsistent quality of feedstock, high transport costs, unreliable power supply, and high financing costs, especially for SMEs. The excessive cost of transporting or storing plastic waste, as well as the cost of importing machinery, discourages small-scale investment. There is also a shortage of skilled personnel who can service and maintain equipment.

- **Quality and price of materials: Packaging producers generate revenue ranging from ₦1 million to ₦1 billion per year.** While some import raw materials, most source raw materials locally and some also use recycled plastics. In the case of the food and beverage packaging, the higher cost of rPET relative to virgin PET is a major challenge that discourages its use. Other factors that hinder the use of alternative packaging materials include the cost of alternative raw materials and availability of technology.

2.1.3 Recommendations

A well-designed communication campaign could raise awareness in communities that are currently unaware of the potential benefits of recycling plastic waste and encourage them to adopt the 3 Rs (reduce, reuse, and recycle). Boosting point-of-use collection through deployment of standardized and segregated wastebins to drive at-source separation of waste will minimize the plastic waste that ends up in dumpsites and improve the volume and quality of feedstock available to recyclers.

2.2 PLASTIC WASTE MANAGEMENT POLICIES AND INSTITUTIONAL STRUCTURE IN LAGOS STATE

Section 2.2.1 outlines the current institutional framework for plastic waste management at the state level for Lagos, followed by the current policies related to plastics at the national and state levels in section 2.2.2. Section 2.2.3 sheds light on the policy and institutional challenges faced by this sector within the state. Finally, section 2.2.4 provides recommendations on overcoming these challenges and establishing a successful policy and institutional framework for MSW at the state level.

2.2.1 Current Institutional Status

The plastic waste management ecosystem in Lagos State involves several different stakeholders from the public, private, and informal sectors, as well as civil society, for example, packaging producers, waste collectors, distributors, retailers, and resin producers. The public sector, including the federal and state governments and its ministries, departments, and agencies (MDAs), are responsible for establishing the regulatory framework and ensuring that adequate environmental regulations are in place to control plastic waste management in the state. LAWMA is involved in regulating waste management and collecting and recycling plastic waste, while private companies such as Wecyclers and RecyclePoints play a vital role in the manufacture, collection, and recycling of plastics. Apart from PPPs, there are also partnerships between private companies.¹⁵

¹⁵ The major PSPs and NGOs in Lagos State are involved in plastic production and waste management including collection, transportation, recovery, recycling, and trade of both recovered and recycled materials.

2.2.2 Current Status of Policy Framework

A timeline of the plastic-related policies introduced in the country from 1989 until 2020 is shown in figure 2.3. For a timeline of all MSW-related policies at the national level, see section 1.2.2. The lack of a comprehensive national framework has led to inconsistent and fragmented implementation of policies promoting resource recovery and circularity in plastic waste management by cities and states in Nigeria. A weak policy framework that hinders implementation and enforcement of existing policies is a challenge (UNIDO 2021).

Additionally, a proposed bill to prohibit the use, manufacture, importation, and sale of plastic bags in the country was presented to the National Assembly in 2019 and seems to have stalled (Asadu 2019).

Figure 2.3 Timeline of plastic-related policies in Nigeria

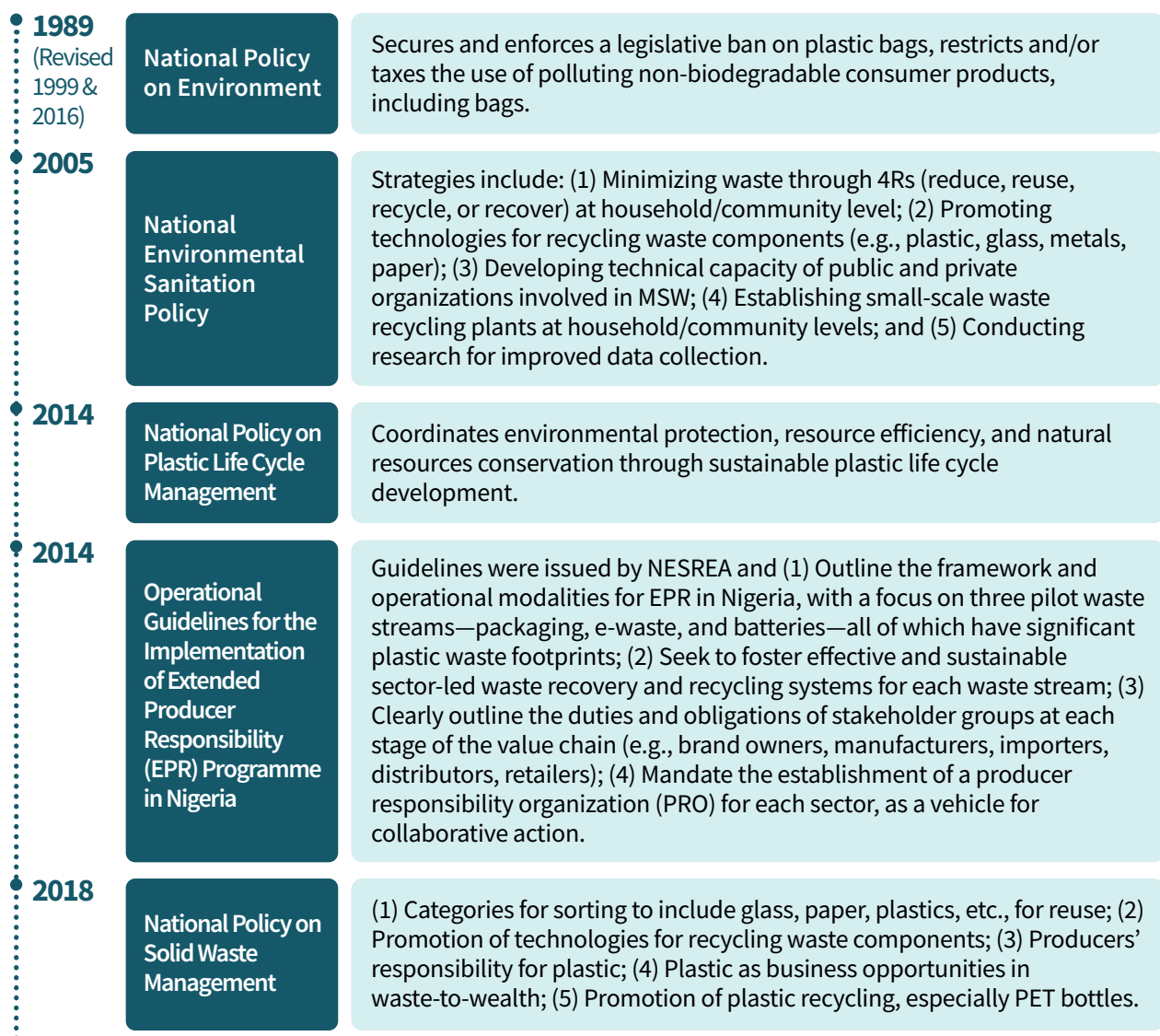


Figure 2.3 Timeline of plastic-related policies in Nigeria (contd.)



Source: Adapted from UNIDO 2021.

Note: DRS = deposit refund scheme, EPR = extended producer responsibility, EPS = Expanded Polystyrene, MSW = municipal solid waste, NESREA = National Environmental Standards Regulations and Enforcement Agency, PET = polyethylene terephthalate, PRO = producer responsibility organization, rPET = recycled polyethylene terephthalate, SUP = single-use plastic.

2.2.3 Challenges

The Lagos State Ministry of Environment (LS-MoEnv) and LAWMA have taken proactive steps to overcome challenges faced in addressing plastic waste management by developing a plastic waste management policy for the state in 2021. Although the policy has not been formally published, it is a clear indication of the state's commitment to address this issue. The policy does not assign responsibilities to a government agency but shows the potential for collaboration and cooperation among national and state players (UNIDO 2021). Despite the efforts made by the Lagos State Government to manage plastic waste, there are still some challenges in the policies and institutional structures.

- **Financial resources:** The Lagos State Government has limited financial resources to fully implement and sustain the plastic waste management policies and institutional structures. This may limit the effectiveness of these policies and institutions in the long term.
- **Infrastructure:** The state's infrastructure is not fully equipped to handle the volume of plastic waste generated. The collection and transportation systems for waste management are often inadequate, which can result in the accumulation of waste in public spaces.
- **Compliance of informal sector:** The involvement of the informal sector in plastic waste management poses a challenge to the policies and institutional structures. Many waste

collectors and recyclers operate informally and lack the capacity to comply with the regulations and policies put in place by the government.

- **Enforcement:** One of the major challenges facing the plastic waste management policies in Lagos State is enforcement. The policies and regulations are often not enforced effectively, leading to noncompliance by residents and businesses.
- **Public awareness:** Although the government has launched public awareness campaigns, many residents are still not fully aware of the need to manage plastic waste properly. This lack of awareness can result in noncompliance with the policies and regulations.

Addressing these challenges will require a concerted effort from the government, private sector, civil society, and residents to ensure that plastic waste is properly managed in Lagos State.

2.2.4 Recommendations

The following recommendations are proposed to improve the policy and institutional structure particularly for plastic waste management in Lagos State:

- **Increase resources:** Support plastic waste management initiatives in Lagos State. This should include increasing funding from the private sector (including an EPR scheme for brand owners, retailers, and packaging industry) and exploring innovative financing mechanisms such as green bonds and PPPs.
- **Encourage infrastructure development:** Invest in infrastructure development, collection, and transportation systems; build recycling facilities; and establish appropriate disposal sites aiming to also support the informal sector.
- **Formalize the informal sector:** Provide training and support for informal waste collectors and recyclers, foster cooperatives, and offer financial incentives for formalization.
- **Strengthen enforcement:** Increase fines and penalties for noncompliance, improve monitoring and surveillance, and implement a reward and sanction system.
- **Create public awareness:** Raise public awareness about the importance of proper plastic waste management in the following ways: (1) Increase participation of the private sector and spending by brand owners, retailers, the packaging industry; (2) Establish a per person budget (\$0.5 to \$1 per year); (3) Raise public education campaigns; (4) Work with community leaders and civil society organizations; and (5) Leverage social media.

In addition, recommendations for improvements in plastic waste management and policies for Lagos State are covered in more detail in section 3.4 on EPR.

2.3 TRANSITIONING TO A CIRCULAR ECONOMY FOR PLASTICS IN NIGERIA

As Nigeria's economic growth spurs an increase in domestic consumption patterns and the concept of circular economy gains traction as a model for green growth, it is imperative that the country starts transitioning toward a circular economy model. A sector assessment conducted in 2021 for five countries in Sub-Saharan Africa—Côte d'Ivoire, Ghana, Nigeria, Rwanda, and South Africa—identified five key areas for a circular economy, including food systems, packaging, the built

environment, electronics, and fashion and textiles. In all sectors, a move toward a more circular—as opposed to the traditional ‘take-make-waste’ linear model—economy will help drive green growth and employment (WEF 2021).

In the context of food systems, circular economy principles can help feed growing populations in Sub-Saharan Africa, especially coupled with the dual challenges of increasingly scarce resources and climate change impacts. Examples of a more circular food system include efficient use of resources such as energy and water, reduction in post-harvest losses through better storage and transportation, and improvements in waste management through composting.

Approximately only 30 percent of Africans can afford to live in formal built environments. As this number increases over time, the demand for new buildings and infrastructure will become even more critical. Therefore, a move toward increased circularity regarding the built environment is crucial. This will result in improved building design, use of recyclable materials, more ‘green’ buildings, and proper waste management.

The growth of e-waste globally is already an important waste and transboundary issue. In the case of electronics, circular economy solutions help in improved e-waste management, such as by investing in recycling facilities, increasing producer responsibility, reusing product components, and extending product lifetimes.

Fashion and textiles are another significant global sector. Circular economy can drive green manufacturing in the sector and increase upcycling to meet the rising demand for clothing in the continent.

Packaging is the dominant sector of plastic waste, both globally as well as in Nigeria.¹⁶ The current challenges of plastic packaging include its non-biodegradability, short useful lifespan, and loss of economic value. Most plastic packaging is used only once before it becomes waste. Unless it is recovered and recycled or, undesirably, disposed of by incineration or open burning or landfilling, it remains in the environment for hundreds of years. About 95 percent of the value of plastic packaging, estimated to be \$80 billion to \$120 billion per year globally, is lost to the economy after its use. In Nigeria, assuming a 1.1 million MT of plastic waste, the loss is approximately \$220 million. For these reasons, it is crucial to address the challenge of plastic packaging using the basic principles of circular economy, that is, waste reduction, reuse, and recycling.

The transition toward a circular economy for plastic in Nigeria is in its nascent stage. Several successful circular economy models and technologies already exist in Nigeria, including software applications and technologies, buyback schemes, upcycling, and reprocessing of waste. In place of the linear trajectory of its waste management system, Nigeria could explore alternative approaches to create new economic opportunities in this sector (WEF 2021).

To enhance a circular economy for plastics, several strategies can be implemented:

- **Improve basic MSW service provision:** Basic services such as collection and processing, followed by treatment and recycling, must first be enhanced. Source segregation of plastics must be mandated to facilitate recycling. Deposit refund schemes (DRS) commonly used for

¹⁶ Calculated based on data by Ritchie and Roser (2018) available on the website: <https://ourworldindata.org/plastic-pollution#which-sectors-produce-the-most-plastic>.

aluminum cans and glass bottles could be adopted for plastic bottle collection. Such a model is currently being tested in South Africa (WEF 2021).

- **Introduce and harmonize legislation to boost recycled plastics:** With the regulatory standards for recycling of food contact PET approved since 2019, the country needs to introduce complementary legislation to require the use of recycled plastics in packaging and disincentivize the use of virgin plastics for packaging to create a vibrant local market for rPET. Nigeria can also champion harmonized regional recycling standards and plastic waste trade regulations to support plastic trade between countries and help ensure sufficient feedstock for large-scale recycling plants, thus decreasing long-term overall costs and sensitivity to global market fluctuations. Bioplastics could also benefit from a standardized regional system.
- **Introduce tax incentives to promote recycling:** Recycling can be incentivized by offering tax breaks for recycling infrastructure. Taxes may be introduced on the use of virgin plastic.
- **Encourage opportunities in design innovation:** While this may be a challenging task given the lack of plastic manufacturers at the regional level in Sub-Saharan Africa, Nigeria is a key player in domestic production and imports of plastic raw materials. Nigeria could play a convening role in bringing other large regional players to form coalitions to encourage producers to adopt strategies to decrease plastic waste. This could be done through changes to packaging design by, for example, requiring reuse of certain materials.
- **Promote reuse in the B2B segment:** Reuse of plastic packaging, particularly for the B2B segment, can have substantial benefits if adopted across sectors.
- **Explore bioplastics:** Bioplastics have several potential benefits, including reduced reliance on fossil fuels, lower greenhouse gas (GHG) emissions, and reduced environmental impact. While there is growing interest in bioplastics in Africa, adoption of bioplastics is still in its preliminary stages and there are several challenges that need to be addressed. One of the biggest challenges is the lack of infrastructure for bioplastics production and disposal in many African countries. There is also a need for more education and awareness about the benefits and uses of bioplastics among consumers, businesses, and policy makers.

Monitoring plastic producers and their contributions (production, collection, and recycling) is important as they are the key players in the production and consumption cycle. By monitoring their activities, it is possible to identify inefficiencies and opportunities for improvement to develop strategies to move toward a circular economy for plastics. Additionally, monitoring can help ensure that producers are held accountable for the environmental impact of their activities and incentivize them to adopt more sustainable practices. This can contribute to the transition toward a more resilient and sustainable economy.

Box 2.1 describes the efforts of two successful entrepreneurial initiatives, Plastic Bank and GIVO, by offering incentives to communities to collect and recycle plastic waste.

BOX 2.1 ENTREPRENEURIAL INITIATIVES PROVIDE INCOME TO COMMUNITIES IN EXCHANGE FOR PLASTIC WASTE

Canada-based for-profit social enterprise started the first Plastic Bank in 2013. It provides an income and benefits such as access to benefits like health, work and life insurance, digital connectivity and fintech services for local communities in vulnerable coastlines across the world. About 23,000 people in countries like Haiti, the Philippines, Indonesia, Brazil, and Egypt collect plastic waste from their communities and deposit it at local collection points. In exchange, they receive income and other benefits from Plastic Bank.

In 2022, Plastic Bank collected and recycled about 29,996,345 kg of ocean-bound plastic. In the last ten years, Plastic Bank has recovered a billion bottles and increased its beneficiaries' income by up to 43 percent. Owners of the small local companies who hire them can earn up to \$3,000 a month.

The plastic's value is calculated by weight. A mobile block chain-based banking app manages payments, stores credit, and validates impact claims. The app uses cutting-edge technology, such as Smart Contracts, to ensure that all transactions are secure and transparent. In this way, the benefits for communities are not threatened by corruption or fraud. Developed in cooperation with IBM, the app claims to use the same infrastructure as some of the world's biggest banks, allowing for infinite scalability.

Increasing community recycling through GIVO

GIVO (Garbage In Value Out) is a company that focuses on solving waste management and plastic recycling issues in Nigeria. GIVO collects recyclable materials directly from households and businesses, which are then transformed into consumer and industrial goods. The company aims to create modular recycling centers in various communities, which would act as hubs for returning value back to the community as 'social plastic' and promoting a circular economy. GIVO centers are already operational in Lagos and Abuja and more centers are scheduled to open in the near future.

GIVO centers are digitally enabled and serve as central locations for the interception and aggregation of post-consumer plastic. The plastic is processed into flakes/pellets, which can then be reintroduced in the plastic value chain. At its core is the GIVO digital solution, a cloud-based data management platform that includes IoT-enabled hardware elements such as smart weights, recycling equipment, and biometric scanners. The data collected during the plastic's journey ensures a clear chain of custody and reduces the risk of fraud while providing clear evidence to all stakeholders.

Each GIVO center covers an area of 2–5 km and serves about 10,000 people. The localized collection radius enables collectors to reach local households on foot or e-bike, reducing the carbon footprint of standard waste collection services. For every kilogram of plastic waste collected, a depositor is paid an incentive of \$0.2.

Through this approach, GIVO is building partnerships with communities to reduce environmental waste, improve public health, and create value where none existed before. The return on center capital investment is expected to be achieved within two years. Hence, the concept currently relies on partial funding and can also be considered a social investment project.

Note: For more information on Plastic Bank, visit the official website of Plastic Bank at <https://plasticbank.com/>. For more information on GIVO-Warwick Nigeria, visit the official website of GIVO Warwick at <https://warwick.ac.uk/fac/sci/eng/givo-warwick/>.

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CHAPTER 3

SETTING THE FRAMEWORK FOR AN EPR MODEL FOR NIGERIA



Further information on this topic is available at:
Improving Solid Waste and Plastics Management in Lagos State:
Guidance Document on Implementing Extended Producer
Responsibility for Plastic Packaging (Internal report).

3.1 INTRODUCTION

The concept of extended producer responsibility (EPR) is based on the ‘polluter-pays’ principle, according to which producers should be held responsible for products they place on the market throughout their whole life cycle. Hence, the producer responsibility goes beyond sales and provision of warranties and encompasses product take-back, recycling, and their sustainable disposal at the end-of-life stage.

EPR is an ecological policy introduced by Professor Thomas Lindqvist of Lund University in Sweden (Lindhqvist and Lidgren 1990). In response to growing packaging volumes, landfill space constraints, and increasing waste collection fees for citizens, Germany acted in 1991 by implementing the Packaging Ordinance VerpackV. Ever since, EPR has gradually spread to other countries, covering not only packaging but also all kinds of products: electronic and electrical equipment, batteries, furniture, tires, oil, paper, recreational boats, agricultural, plastics, construction and demolition waste, vehicles, and so on. By the end of 2024, the European Union (EU) will expand the scope of EPR to single-use plastics (SUPs) and fishing gear containing plastics, followed by the implementation of EPR for textiles in January 2025.¹⁷

In Nigeria, the EPR system was introduced in 2014 but its application was limited to three sectors on a voluntary basis. Successful enforcement of a mandatory EPR system for plastic packaging, enabling the collection of funds from producers, importers, and brand owners and their redistribution to various actors along the plastic waste value chain, will foster waste management and environmental protection in the country. It will create a level playing field where responsibility for collection and recycling is not just part of corporate social responsibility (CSR) or marketing. The first and most obvious benefit of introducing EPR is that materials collected through EPR programs are often of better quality than those collected through traditional waste management systems because sorting is done better (ideally at the source). If designed and enforced properly, EPR will create demand for recycled materials, as mandatory recycled content might be part of the policy. Also, producers can be incentivized to design products that can be recycled more easily through the eco-modulation of EPR fees. These will contribute to the growth of the collection and recycling industry as well as infrastructural upgrades. Furthermore, it will improve the overall waste management and diversion from landfill by discouraging collection of only waste plastics having value.

A field study conducted in 2017, quoted in the *National Policy on Plastic Waste Management (NPPWM) 2020*, revealed that the packaging industry in Nigeria contributed to 63 percent of plastic waste generation in the country (FMEnv 2020). This highlights the scale of the problem and indicates that packaging is the largest contributor to plastic pollution in the country. Hence, swift implementation of EPR for plastic packaging should be a priority.

3.2 CURRENT STATUS

Three producer responsibility organizations (PROs) are already operating in Nigeria for three sectors: food and beverage [Food and Beverage Recycling Alliance (FBRA)]; electrical and

¹⁷ By January 31, 2024, EU will expand the scope of EPR to single-use plastics (SUPs) and fishing gear containing plastics (Directive (Eu) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment). By January 1, 2025, EU proposes to implement EPR for textiles (Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste). Visit EU’s website for more information at <https://eur-lex.europa.eu/eli/dir/2019/904/oj>.

electronic equipment [E-waste Producer Responsibility Organisation Nigeria (EPRON)]; and battery producers [Alliance for Responsible Battery Recycling (ARBR)]. All three were registered between 2018 and 2019 as a response to the *Operational Guidelines for EPR Programme in Nigeria* published by National Environmental Standards Regulations and Enforcement Agency (NESREA) in 2014, as described in box 3.1.

BOX 3.1 OPERATIONAL GUIDELINES FOR EPR PROGRAMME IN NIGERIA, 2014

Operational Guidelines for the Extended Producer Responsibility (EPR) Programme in Nigeria were developed by NESREA for all sectors of the economy, without specific emphasis on food and beverage or other fast-moving consumer goods (FMCG) industries. The categories of waste streams covered include the following:

- Packaging materials
- E-waste materials
- End-of-life vehicles and related accessories
- Chemicals, pesticides, and pharmaceuticals.

The guidelines were developed through a comprehensive process of stakeholder consultations and expert review sessions. They are intended to be a reference guide for all key stakeholders including producers, PROs, recyclers, collectors (both formal and informal), and consumers.

The document outlines the goals of EPR in Nigeria, highlights the benefits for the country, and provides a list of packaging materials amenable to EPR. The guidelines also include instruments that could be applied to implement EPR (for example, take-back schemes, deposit refund systems, and tradeable recycling credit systems).

An important aspect of the guidelines was the definition of producers which includes manufacturers, converters, brand owners, importers/distributors, and retailers. The guidelines also specify the roles and responsibilities of each actor in the waste management chain. However, except for general operational criteria, no tangible targets were set.

Mandatory EPR for plastic packaging has not been operationalized until now.

Note: For more information on EPR in Nigeria, visit the UN website at https://www.un.org/ecosoc/sites/www.un.org/ecosoc/files/files/en/2018doc/3_%20Anukam.pdf.

The FBRA and ARBR operate as voluntary schemes with 29 and 75 members, respectively. Only EPR for electrical and electronic equipment (EEE) has become mandatory in Nigeria. This progress was made possible by the *Guidance Document for the Implementation of EPR Programme for the Electrical/Electronics Sector in Line with Circular Economy*, which was developed by NESREA in 2020. The document was followed by the *National Environmental (Electrical and Electronic Sector) Regulations*, published by the Federal Ministry of Environment (FMEnv) in August 2022. The first document gave a mandate to EPRON, officially recognizing it as a PRO and obliging producers to register (both with EPRON and NESREA). The latter document adds concrete measures and enforceability, also including penalties for noncompliance, as mentioned in table 3.1.

Table 3.1 Guidance Document for the Implementation of EPR Programme for the Electrical/Electronics Sector, 2020, and National Environmental (Electrical and Electronic Sector) Regulations, 2022

Guidance Document for the Implementation of EPR Programme for the Electrical/Electronics Sector in Line with Circular Economy, August 2020	The document focuses solely on the electrical/electronics sector and its associated waste. It provides definitions of key terms (including ‘producer’, ‘electrical/electronic equipment’, ‘collector’, ‘recovery’, ‘recycling’, ‘recycler’, and ‘PRO’). Moreover, it defines and allocates responsibilities to key stakeholders (including NESREA). The document also sets short-term, medium-term, and long-term targets for collection and recycling. Additionally, it mandates producers to register with NESREA and EPRON, pay levies to EPRON, and describe monitoring and reporting requirements. Overall, the document is a significant step toward EPR implementation and operationalization. However, the targets set in the document are not ambitious enough. While quantitative targets (for example, 300 metric tons [MT] or 6,000 MT per year) may be a good starting point when there is no reliable data on the placed-on-market (POM) volumes, they should not be binding in the long term. Instead, a percentage target in relation to POM is advised. The Guidance Document provides some flexibility to EPRON, requiring after July 2023 collection of either 6,000 MT per year or 300 MT and 1 percent of the average of EEE placed on the market in the three preceding years, rising to 3 percent from 2023, and then 5 percent from 2025.
National Environmental (Electrical and Electronic Sector) Regulations, August 2022	The regulations provide concrete measures and enforceability to the EPR framework. The main requirements of the EPR system are as follows: • A person who imports, exports, manufactures, assembles, distributes, or retails EEE shall subscribe to the EPR Programme and the Buy Back policy. • The document provides clear definitions for important terms, including ‘producer’, which is broadly defined as the brand owner, manufacturer, franchisee, assembler, distributor, retailer, or first importer but also the local manufacturer or importer of new and used EEE to be placed on the national market by sale or donation. • Producers need to register with NESREA and the PRO, and pay a recycling fee to the PRO. • Responsibilities are given to producers, collectors, recyclers, and consumers, with authority given to NESREA. • Offences are defined and penalties indicated (including those for not registering with NESREA and the PRO). • Categories of EEE covered by the regulations are listed. The Guidance Document for the EEE sector is referred to as source of provisions that shall be applicable to producers. • The Guidance Document is also mentioned as a source containing roles and responsibilities of stakeholders in the implementation of the EPR Programme. The absence of collection and recycling targets in the regulations means that the targets outlined in the Guidance Document remain applicable.

Source: NESREA 2020; NESREA 2022.

Note: EEE = electrical and electronic equipment, EPR = extended producer responsibility, EPRON = E-waste Producer Responsibility Organisation Nigeria, MT = metric tons, NESREA = National Environmental Standards and Regulations Enforcement Agency, POM = placed-on-market, PRO = producer responsibility organization.

A similar guidance document and legislation are required for plastic packaging, as voluntary EPR is not effective, nor sustainable, which is reflected by low membership in FBRA and low recovery figures. FBRA reported collecting 28,000 metric tons (MT) of packaging waste, which is only 0.14 kg per person, a fraction of the estimated 7.5 kg of plastic waste per person per year.

Currently, there are no binding country-wide targets for the collection and recovery of packaging waste in Nigeria. NPPWM, released in October 2020, aims to recycle 75 percent of packaging waste by 2030. However, the policy lacks enforceability as there are no operating guidelines and enabling regulations. Moreover, FBRA's commitments are made without real insight into the amount of packaging placed-on-market (POM) by its members and the data shared by members cannot be verified and validated. Also, as FBRA focuses mainly on packaging for food and beverage products, there is a need to create a separate PRO (or PROs) focusing on other packaged products such as personal care and household chemistry.

3.3 CHALLENGES

Aside from issues identified in previous chapters, a few more challenges were captured during stakeholder dialogue held within the EPR workstream:

- **There is a significant presence of informal sector in Nigeria.** Adequate advocacy and inclusion strategy will be necessary for informal waste pickers so that they are not marginalized by the system.
- **Integration of micro, small, and medium enterprises (MSMEs) will have to be addressed so that not only large-scale companies finance collection and treatment of plastic packaging, but small businesses also bear a proportional burden or benefit from thresholds exemptions from some obligations.**
- **Some waste collectors and apps such as PAKAM incentivize residents to separate recyclables from other streams (for example, organics), meaning that some households are used to being paid for their waste, rather than charged for it.**
- **EPR requires separation of packaging from organic waste at the household level, thus lowering operational costs and reducing contamination.**
- **The activities conducted currently are driven by market forces, meaning that only waste materials having value (polyethylene terephthalate [PET] bottles and aluminum cans) are collected for recycling, leaving the 'problematic' materials (plastics hard to recycle or plastics with little or no value) untreated.**
- **The federal system of Nigeria and the existence of 36 federal states and one Federal Capital Territory (FCT) add complexity.** Producers should not be subject to 37 different EPR schemes.
- **There is no central repository of data in Nigeria.** Solid, reliable information on plastics entering the market and exiting it is missing.
- **Access to capital is limited, making investments in waste management infrastructure difficult.**
- **Logistics play a key role.** Due to scarcity of collection and recycling centers, and transfer stations in particular, long-distance transport increases the operational cost.

3.4 RECOMMENDATIONS

Implementation of EPR for plastics requires a strategy for an EPR e-registry as well as a guidance document that will be enforced by appropriate regulations.

3.4.1 Recommendations for Implementation Strategy of an EPR e-Registry

Creation of an e-registry should be the first step on the EPR implementation roadmap as it will provide a reliable overview of market players and volumes of plastics being placed on the market. Provided that waste operators are also obligated to register, the repository would also become a database of plastics collected and processed, which would give a picture of the current collection and recycling rates in Nigeria. In addition, the data collected in a registry are essential in determining EPR financial contributions to be made by producers, by allowing market share calculation of each producer and allocation of the costs to products placed on the market. It also ensures that compliance with collection and treatment targets can be measured and allows oversight by state authorities and other entities, such as NESREA. By increasing transparency in market activities, an EPR registry establishes a fair playing field and minimizes the risk of noncompliance by producers who fail to meet their obligations. While some of the required data might be already available in other sources, it is incomplete and fragmented. The creation of a central repository allows data format harmonization and data gathering consistency, as shown in table 3.2.

Table 3.2 Overview of potential data sources

Type of Data	Data Usage	Data Source
Put on market	Market size knowledge	Customs
	Market size calculation	Trade associations
	Obligation calculation	Registry
Collection	Collection volume	Collectors
	Collection rate	Aggregators
	Collection cost	Recycles Registry
Processing	Recycling volume	Recyclers
	Recovery volume	Other waste processors
	Recycling rate Recovery rate	Registry

Source: World Bank 2024c (internal report).

In the registry, the producers will be obliged to register their company with the company details and the market segment in which they operate and to report the quantities of packaging which they introduce in the market. On the other hand, waste actors will have to log the amount of waste which gets collected, treated, or exported. The obligation to register and report should be embedded in regulations, with penalties for noncompliance.

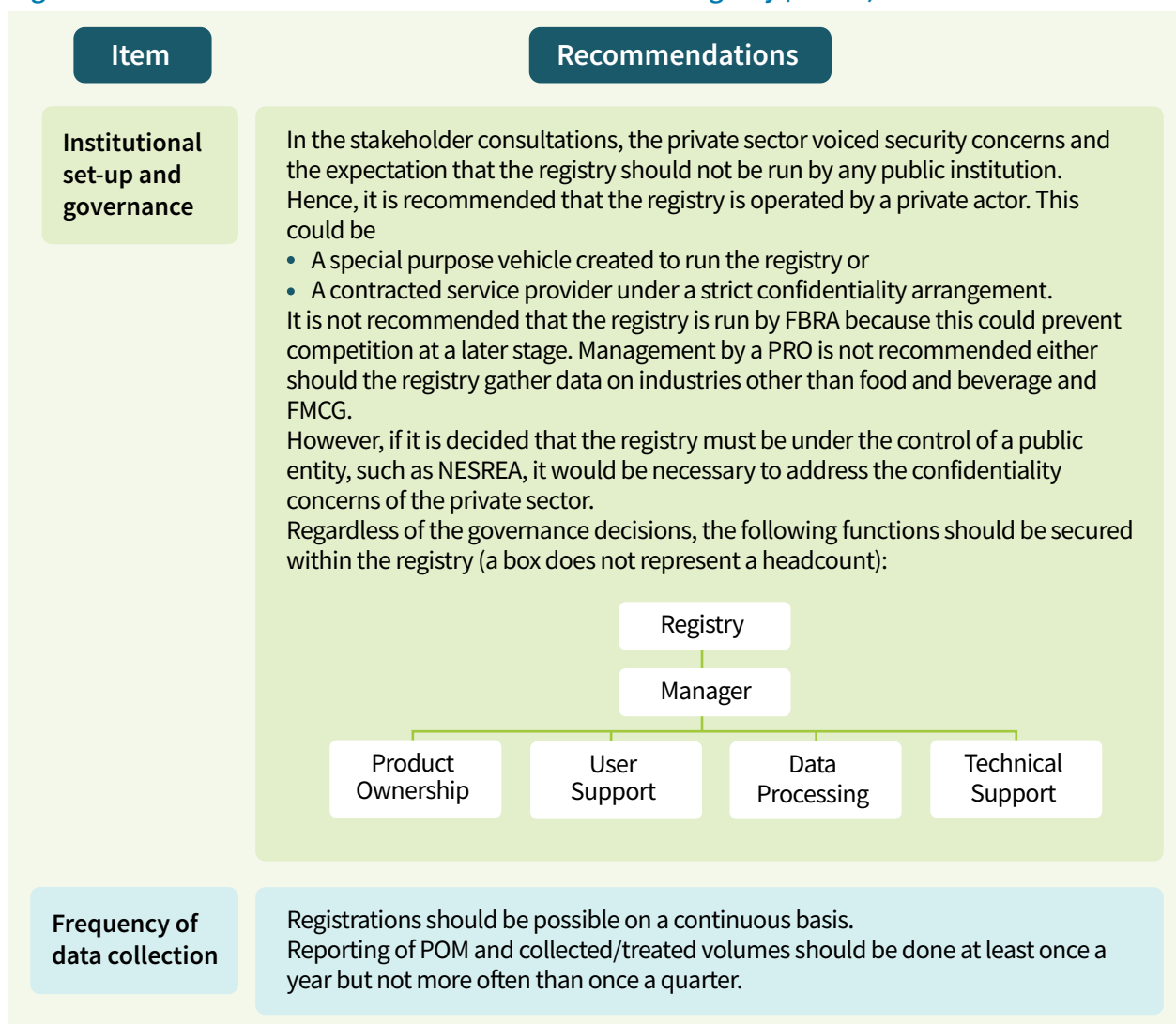
Some of the information could and should be made public (for example, company registration details to facilitate educated purchasing and prevent free riders); however, data specific to sales

should be classified as confidential and thus strictly protected. A good practice, already observed in the joint efforts of EPRON and NESREA in the EEE sector, is to establish the registry as a black box system, that is, data are only visible to authorized users. In this set-up, the registry function is outsourced to a private, third party, who will store and process all the logged data, providing customized access to the PRO and regulator so that EPR fees can be calculated, and producer compliance is monitored. The actual governance and institutional set-up for the plastics registry will have to be decided. Figure 3.1 provides a set of initial recommendations for the creation of an EPR e-registry for plastics in Nigeria.

Figure 3.1 Overview of recommendations for an EPR e-Registry

Item	Recommendations
Registry system scope	• Registration of producers, importers, brand owners, distributors, retailers, waste collectors, aggregators, and recyclers • Gathering of data on materials placed on the market, collected, and processed (and/or exported) • One joint system for all federal, states, and FCT.
Material segmentation	Adequate granularity and segmentation allow assignment of targets and apportionment of costs. On the other hand, excessive segmentation granularity might lead to unnecessary administrative burden. The following material segmentation is recommended, both from a ‘put on market’ and ‘collection and treatment’ viewpoints: • PET • HDPE • Other rigid plastics • Flexible plastics (that is, bags, sachets, foils, and sheets) • Multi-material packaging (that is, beverage cartons, and metal plastic laminates) SUPs and other plastic streams could be added, depending on NESREA’s preference.
High-level technical requirements	• User friendly • Visually appealing • Efficient • Compatible (integrable) with other systems as necessary • Web based • Providing customized access, based on user group • Providing digital security and protection of personal and company-sensitive data, meeting the requirements set forth in the Nigeria Data Protection Regulation 2019, • Open to other potential EPR systems in the future (that is, other waste streams) • Available in English and main local languages.

Figure 3.1 Overview of recommendations for an EPR e-Registry (contd.)

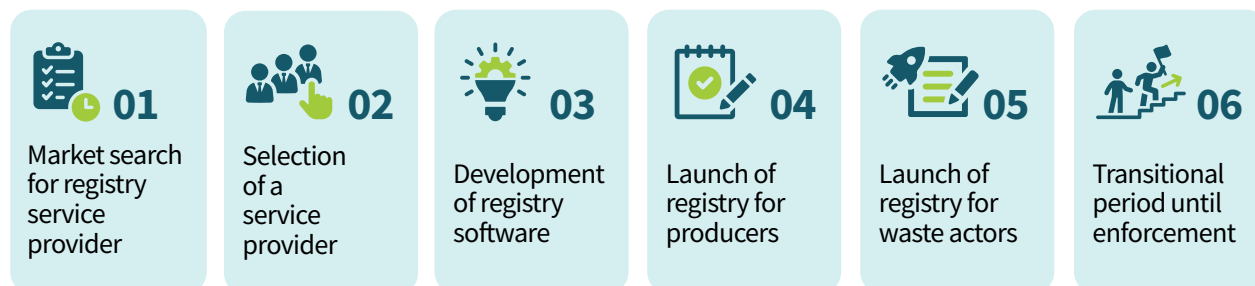


Source: World Bank 2024c (internal report).

Notes: EPR = extended producer responsibility, FBRA = Food and Beverage Recycling Alliance, FCT = Federal Capital Territory, FMCG = fast-moving consumer goods, HDPE = high density polyethylene, NESREA = National Environmental Standards Regulations and Enforcement Agency, PET = polyethylene terephthalate, PRO = producer responsibility organization.

The steps that can be expected to launch the registry are summarized in figure 3.2.

Figure 3.2 Steps to launch EPR registry



Source: World Bank.

3.4.2 Recommendations for Sector-specific Guidelines for Implementation of EPR in the Food and Beverages and Other FMCG Industries

Sector-specific guidelines for implementation of EPR in the food and beverage and other FMCG industries are necessary to overcome the challenges listed in section 3.3. They may draw, in part, from the *Guidance Document for the Implementation of EPR Programme for the Electrical/Electronics Sector of 2020* and should include the aspects summarized in table 3.3 (NESREA 2020).

Table 3.3 Overview of recommendations for sector-specific guidelines for implementation of EPR in the food and beverages and other FMCG industries

Sectoral Guidelines	Recommendations
Target plastic products	Plastic packaging and, depending on NESREA's preference, also other plastic products, for instance, single-use plastic (SUP)
Materials in scope	- Polymer types: - PET - HDPE - Other rigid plastics - Flexible plastics (that is, bags, sachets, foils, and sheets) - Multi-material packaging (that is, beverage cartons and metal plastic laminate).
Producers in scope	- Clear definition of producer is necessary, also including importers, brand owners, distributors, and retailers to avoid ambiguity and loopholes. - Definitions should be harmonious with other laws and regulations in force in Nigeria.
Waste operators in scope	- Clear definitions of collector, aggregator, and recycler as well as collection, aggregation, recovery, recycling, and landfilling are necessary to avoid ambiguity and loopholes. The definitions should also cover informal waste pickers. - Definitions should be harmonious with other laws and regulations in force in Nigeria.
Producer responsibility organization	- Clear definition of a PRO is needed. The guidelines should not be limited to FBRA so as to ensure competitiveness for other players willing to become a PRO and provide producers a choice, especially considering that FBRA intends to focus on food, beverage, and tobacco products only. - Criteria for approving a PRO should be outlined.
Collection and recycling targets	- Targets should be measurable and realistic yet ambitious. They should gradually grow over time to reflect upgrades in technology and infrastructure and motivate their development. - Targets should be allocated separately to each polymer type. - Targets should be adjusted after 1 year from the EPR e-registry launch, when enough data on POM and collected/treated volumes are fed to the system. - Initial targets should be set further to stakeholder consultation addressing scope, segmentation, targets to be achieved, and timelines.

Table 3.3 Overview of recommendations for sector-specific guidelines for implementation of EPR in the food and beverages and other FMCG industries (contd.)

Sectoral Guidelines	Recommendations
Roles and responsibilities of all EPR stakeholders	• All obligations beyond financing the take-back and processing of the waste should be listed. For producers and PRO(s) these should be the following: - Registration - Reporting - Education and outreach - Labelling (for example ‘Do not litter’ symbols), waste reduction - Reuse - Recycled content requirements (especially for PET) - Polymer marking to enable proper recycling. • Responsibilities that can be transferred to a PRO and those which must remain with producers have to be clearly identified. • Responsibilities for waste operators should include the following: - Registration - Reporting - Requirements for setting up collection centers, transfer stations, and recycling sites - Requirements that have to be met by existing collection centers, transfer stations, and recycling sites - Proper waste movement documentation (waste movements traceability and evidence documentation) - Use of personal protection equipment - Responsibilities could also be allocated to consumers. These could include - Obligation to separate packaging from other waste streams and - Ban on burning or dumping plastics.
Penalties	• Definition of an offence should be provided, together with penalties for noncompliance. Penalties should range from monetary fines to sales bans and legal responsibility of CEOs (or other persons accountable for compliance) in front of the court.
Enforcement date	• During the stakeholder dialogue it was pointed out that obligations for producers should be enforced immediately, without any ado. The guidelines should hence provide an ambitious, yet realistic starting date.

Source: World Bank 2024c (internal report).

Notes: CEO = chief executive officer, EPR = extended producer responsibility, FBRA = Food and Beverage Recycling Alliance, FCT = Federal Capital Territory, FMCG = fast-moving consumer goods, HDPE = High Density Polyethylene, NESREA = National Environmental Standards Regulations and Enforcement Agency, PET = polyethylene terephthalate, PRO = producer responsibility organization.

To ensure acceptance, but also to gather useful feedback that can be considered in the EPR design, once drafted, the guidelines should be presented to and discussed with various stakeholder groups.

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CHAPTER 4

BEHAVIORAL INSIGHTS TO REDUCING MARINE PLASTIC POLLUTION IN LAGOS STATE



Further information on this topic is available at:
**Barriers and Solutions for Sustainable Household Waste Management
in Lagos, Nigeria** (World Bank 2024).

4.1 INTRODUCTION

Behavioral science can mitigate climate change, solve environmental challenges, and foster sustainable development.¹⁸ By better understanding the psychological capacity, social influence, and motivation along the decision-making process of environmentally harmful (or positive) behaviors, behavioral science can inform the design of effective interventions and policies that promote sustainable actions. Furthermore, since specific environmental problems, such as solid waste management (SWM) or plastic pollution, are complex and require changes in behavior across individuals, communities, and organizations, tools and methods provided by behavioral science can help develop evidence-based policies tailored to the needs and preferences of different populations.

Several studies from behavioral science investigate waste management behaviors to better understand the primary factors driving sustainable decision-making. In Nigeria, a qualitative study in Ala Ajagbusi revealed that the villagers collectively burn and dump waste under power lines, in dumping sites, and inside drainage out of fear of the negative consequences of waste on their health (Abdulwakeel and Bartholdson 2021). Another study surveying 1,557 participants drawn from households, businesses, and policy makers in Abuja, Nigeria, revealed that insufficient public education on SWM was a critical barrier constraining sustainable waste management (Ezeah and Roberts 2012). Similarly, a study on 600 households from Lagos found that most (67 percent) engage in illegal waste disposal and that gender and previous participation in voluntary service significantly influence the willingness to contribute to the plastic reduction and to participate in the community on this issue, especially for women (Chukwuone, Amaechina, and Ifelunini 2022).

Experimental evidence to improve waste management in African countries is limited. A survey study in South Africa indicated that awareness-raising messages containing moral values and information about available recycling schemes, combined with providing collection services for recyclables, could positively influence recycling behavior among residents (Strydom 2018). Another study in Maputo, Mozambique, implemented a randomized controlled trial with 1,000 households showing that increasing convenience and giving in-kind incentives and guidance can improve pro-environmental behaviors such as recycling and segregating waste (Hosono and Aoyagi 2018).

In other contexts, behaviorally informed interventions have successfully induced sustainable behaviors. For example, researchers in the United Kingdom examined the impact of social norms on recycling behaviors. They found that neighbor participation in recycling activities (such as setting out a recycling box) increased same-block household participation (Tucker 1999). Another study found that a high level of attachment to the neighborhood, community spirit, and peer pressure between households contributed to higher participation rates (Harder, Woodard, and Bench 2006). Regarding waste reduction, researchers found that switching the default option of printers to double-sided printing reduced paper consumption at a university (Egebark and Ekström 2016). Finally, another study showed that providing feedback on littering rates decreased the practice (Sibley and Liu 2003). However, most of these studies come from high-income countries or small-scale interventions that have not been replicated in developing countries.

¹⁸ Behavioral Science is defined as the discipline that focuses on the analysis of human behavior, at the individual or group level. By doing so, it follows scientific methods to explain and predict behavior (Hallsworth 2023).

The current chapter expands the understanding of sustainable waste management for households in Lagos, Nigeria. Domestic waste management is defined here as a complex decision-making process followed by households with the prime objective of averting hazards of residual materials (UNEP 2023). The decisions and actions of this process include, but are not limited to, generating, handling, processing, collecting, storing, transporting, and disposing of waste. The study identifies, analyzes, and presents the obstacles to four behaviors critical to sustainable waste management: reducing, reusing, recycling, and disposing of waste. Behavior change is most likely when individuals have the capability, opportunity, and motivation to engage in the desired behavior.¹⁹ Therefore, interventions that target one or more of these components are more likely to be effective in promoting sustainable waste management for Lagos households. The Lagos Waste Management Authority (LAWMA) distinctly acknowledges the relevance of behavior change and attitudes as key sustainable factors.²⁰

The analysis reveals several barriers to sustainable domestic waste management along the process leading to its generation and disposal. In the planning and shopping stage, convenience and personal preferences were identified as significant barriers to sustainable practices. At the stage of product transportation, the convenience and prevalence of plastic bags were identified as barriers. The study also identifies lack of awareness, habituation, lack of accountability, and misbeliefs in consequences as barriers at the point of product consumption. Lastly, the study found that proper waste disposal options are not readily available to all citizens at the disposal stage, and many informal and non-sustainable options are currently employed. The study also reveals that the visibility of poor waste management practices in the community and the prevalence of social norms contribute to inadequate disposal.

The findings presented in this chapter suggest the need for increased education, awareness, and effective communication of sustainable waste management practices and the development of strategies to incentivize and facilitate more sustainable behaviors at the community level. Furthermore, the study highlights the need for a multipronged approach to promoting sustainable waste management practices.

4.2 DIAGNOSTICS METHODS AND PARTICIPANTS

This research was designed to understand the factors impeding the behaviors along the journey experienced by households that lead to sustainable waste management. The research followed a mixed methods approach. An exploratory study was based on qualitative instruments that included focus group discussions (FGDs), in-depth interviews (IDIs), key informant interviews (KIIs), and non-intrusive observations (NIOs), while the quantitative component included a household survey questionnaire. Activities were conducted in May 2022 (KIIs), December 2022 (FGDs, IDIs, and NIOs), and February to March 2023 (survey).

¹⁹ The barrier analysis follows the COM-B framework introduced by Michie et al. (2005) and Michie, Van Stralen, and West (2011), based on the premise that behavior change is influenced by capability, opportunity, and motivation. Capability refers to an individual's physical and psychological ability to perform an action; opportunity encompasses contextual and social factors influencing behavior; and motivation includes the individual conscious and unconscious processes that drive behavior. Examples of such factors include awareness and skills to effectively sort waste or the affordability and access to waste management items (for example, dustbins or bags) or the custom of not littering nor buying plastic products or the beliefs that plastic pollution will have hazardous consequences.

²⁰ LAWMA has identified the attitudes of the citizens to waste handling as a threat to their domestic waste collection program (LAWMA 2021).

4.2.1 Exploratory Work

Five of 20 local government areas (LGAs) in Lagos State were selected for applying FGDs, IDIs, and NIOs. The LGAs are Amuwo Odofin, Badagry, Ikorodu, Epe, and Ibeju-Lekki. Their selection was based on their proximity to coastal and river areas, the prevalence of poorer communities, and the presence of government community-based programs. A total of 62 individuals participated in 27 activities, including residents of selected areas, community leaders, waste pickers, researchers, and nongovernmental organization (NGO) staff.

A total of 10 IDIs (including two women) were conducted, two per LGA. All respondents were over 36 years of age, and five were married. A majority had at least some secondary education or higher (seven respondents) and lived in a community with access to waste services (six respondents). As for FGDs, one was conducted in each LGA with 40 participants (15 women). About 90 percent of respondents were married, and 67 percent were between 36 and 50 years. A majority (62 percent) had at least some secondary education.

Nine stakeholders were selected for the KII. These were selected based on their role within the plastic and waste market. Participants were selected from three regulators: National Environmental Standards and Regulations Enforcement Agency (NESREA), Lagos State Environmental Protection Agency (LASEPA), and LAWMA; one private company: Lafarge Geocycle; one industry association: Recyclers Association of Nigeria (RAN); two collectors or private sector partnership (PSP); one connector in charge of the PAKAM mobile app; and finally, two environmental specialists from the University of Lagos.

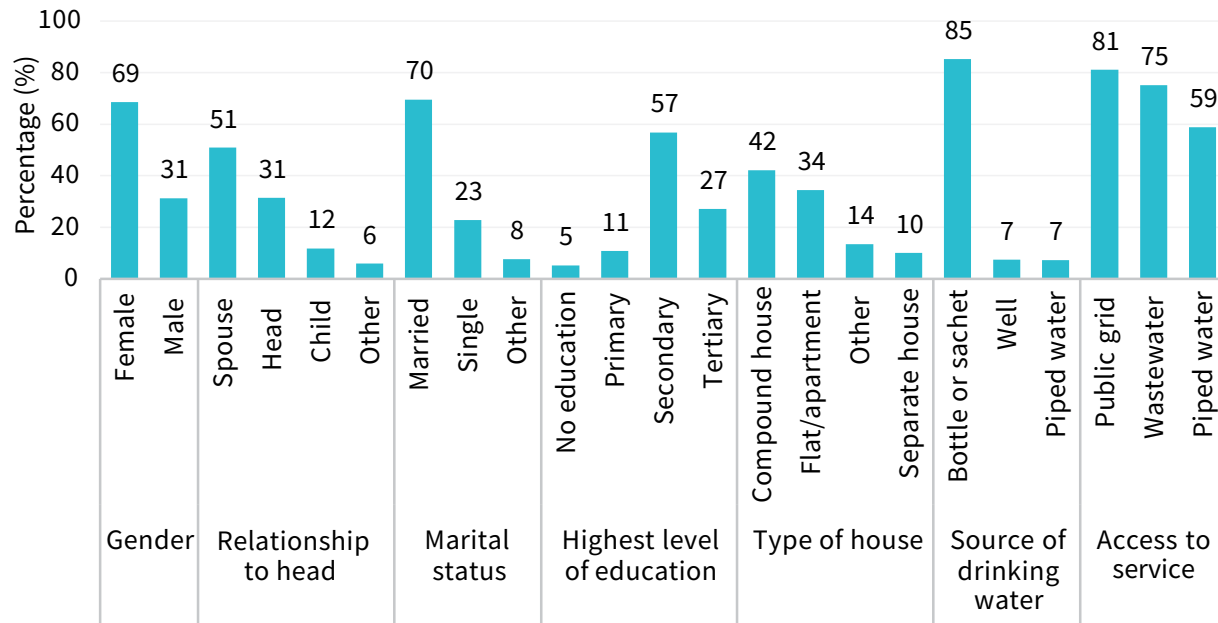
4.2.2 Survey

A multistage sampling procedure involving LGAs, enumeration areas (EAs) or cluster of housing units, and households was applied. The EAs were delineated by the National Population Commission and used by the National Bureau of Statistics (NBS). In the first stage, 10 LGAs were randomly selected. In the second stage, 10 EAs were purposively selected from each of the selected LGAs, giving a total of 100 EAs for data collection. The purpose of selection of EAs was to ensure that housing units in low-income locations in the LGAs were covered and was based on information provided by the Lagos State Director and the NBS, including previous NBS state surveys. Lastly, 11 households were randomly selected from each EAs to give a final sample size of 1,100 households.

The targeted respondent was the household member responsible for chores related to household waste management. The main participants' characteristics are presented in figure 4.1. Most respondents were female (69 percent), married (70 percent), either the household head or spouse (82 percent), and had a median age of 38 years. Half of the sample had completed secondary education (53 percent). On average, households had four members, one under 18. Most of the houses visited were compound buildings or apartments (76 percent) and the majority had a connection to the electricity grid (81 percent), access to wastewater (75 percent), and piped water (59 percent), although drinking water was sourced from bottles and sachets.

The average monthly amount spent was ₦4,556 on medical expenses, ₦5,541 on utility bills, ₦5,662 on social activities and entertainment, ₦5,956 on fuel, ₦6,287 on airtime, ₦10,422 on education, ₦10,564 on transport, ₦12,439 on rent, and ₦45,013 on food and groceries.²¹

Figure 4.1 Main characteristics of survey respondents



Source: Original calculations for this publication.
Note: N = 1,000.

4.3 BARRIERS TO SUSTAINABLE WASTE MANAGEMENT

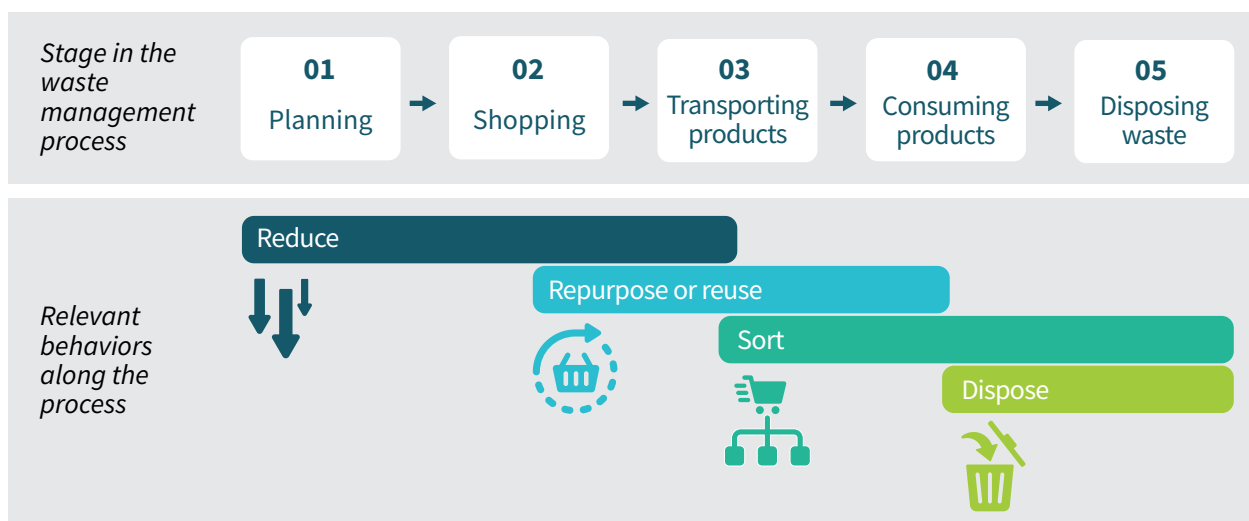
This section describes the main barriers identified through the research activities and provides supporting evidence drawn from the responses of interviewed participants. The results presentation follows an ideal waste management journey for household members and the expected sustainable behaviors along the process.

4.3.1 A Sustainable Waste Management Journey

A condensed model of the desired decision-making process for sustainable household waste management is presented in figure 4.2 as a reference to contrast the actual behaviors revealed by respondents. Five main stages were identified along the journey: planning for shopping, shopping for goods and products, transporting those products, consuming them, and lastly, correctly disposing of the waste after consumption for collection. Additionally, four relevant sustainable waste management behaviors are defined and mapped according to the relevant stage they are expected to happen: reduce waste generation, repurpose, or reuse generated waste materials, separate waste generated at the source, and dispose of waste properly.

²¹ Household welfare level or socioeconomic status was assessed by the expenditure level. Expenditure quintiles were estimated based on the total monthly expenditure, as the aggregation of the nine expenditure categories.

Figure 4.2 Decision-making process for sustainable household waste management



Source: World Bank 2024.

Several insights can be drawn from the depicted process. First, even if simplified, sustainable waste management entails coordinating several interconnected decisions and actions. This is particularly relevant if we consider that adequate waste management at the household level is a precondition for sustainable waste management at the community level. Second, most of these behaviors occur during or after the consumption stage. Thus, relevant decisions that lead to these actions are taken in advance, at previous stages, for example, during product shopping (for example, what type of material to buy) or transport of goods (for example, which bag material to use). The following section documents the barriers identified to these sustainable behaviors towards waste management at home.

4.3.2 Planning and Shopping: Barriers to Reduce Plastic Consumption

The results indicate significant contextual and social barriers to sustainable shopping practices related to the availability of resources at the planning stage. Specifically, most survey respondents reported that they only shop when they need something (57 percent) or once a week (25 percent). Moreover, only 42 percent of respondents reported keeping a budget for shopping, suggesting that financial considerations and daily needs might take priority over environmental concerns regarding shopping decisions. Additionally, 44 percent of respondents had food delivered or taken away in the last seven days. Food delivery is often done with plastic or nonrecyclable containers and could be a significant source of unsustainable waste generation.

Results also suggest that personal and family preferences, needs, and goals for shopping may not be aligned with environmental goals. Specifically, respondents reported financial convenience as a critical factor in their shopping decisions, often opting for small single-use packages. Furthermore, only 10 percent of respondents considered their community to have problems with waste, suggesting a lack of awareness or concern for the environmental impacts of such packaging choices. These results highlight the need for increased education and awareness about the negative impacts of single-use packaging and strategies to incentivize and facilitate more sustainable shopping practices.

It is worth mentioning that survey results show that many households produce a considerable amount of plastic (83 percent) and food waste (80 percent), and the most common type of plastic waste produced is water sachets and LDPE including clothing wraps, furniture wraps, or garment bags. On average, a vast majority generate a bag of waste daily (92 percent of survey participants). Plastic was the predominant type of waste households consumed and disposed of in the last seven days before the survey (83 percent). Others included food scrap (80 percent), cans (56 percent), paper (49 percent), glass jars (30 percent), clothes or fabrics (22 percent), cardboard (18 percent), cartons or tetra packs (18 percent), batteries and electronics (11 percent), aluminum foil (9 percent), and metals (3 percent).

4.3.3 Transporting Products: Barriers to Reduce, Repurpose, and Reuse

Other significant barriers to sustainable shopping practices identified in this study are the convenience and prevalence of plastic bags. Most respondents (62 percent) reported discarding nylon bags received with purchases, with a larger portion of wealthier households discarding bags. Only 33 percent of respondents reported reusing bags for carrying. A smaller proportion (35 percent) of respondents reported using the bags for storage or in waste bins, while a tiny percentage (2 percent) mentioned burning the bags or storing them for recycling (0.4 percent). These results suggest that while some individuals are trying to reuse the bags, strategies are still needed to reduce the overall reliance on plastic bags. These findings highlight the need for a multipronged approach to promoting sustainable shopping practices, addressing convenience and personal preferences.

4.3.4 Consuming Products: Barriers to Repurpose, Reuse, and Sort

Most of the relevant, sustainable waste management behaviors converge at the point of product consumption: reduction, repurposing, and segregation. The study findings indicate that several behavioral and structural barriers hinder these actions: lack of awareness and memory, habituation of less conscious behaviors, lack of accountability, and misbeliefs in consequences. Additionally, resource and time constraints remain a challenge for households and are exacerbated by limitations at the community level, such as inadequate waste collection and disposal infrastructure.

The lack of awareness and knowledge of waste management practices is a significant barrier, with less than one-fifth of participants from FGDs knowing how to reduce the waste in their household or sort waste at the source and not knowing who is responsible for managing waste in their community. These results resonate with the general lack of awareness of environmental issues. At the national level, only one-third of citizens have heard about climate change and half consider pollution a problem for their community (Afrobarometer Data 2023). Additionally, there is a prevalent habit of not sorting and recycling materials after consumption (18 percent of survey respondents). However, most can correctly distinguish types of waste materials and, at least for plastic, know that they could be recycled or reused regardless of the socioeconomic status, as shown in table 4.1. Memory and time were also barriers, with respondents mentioning forgetfulness and lack of time as additional reasons for not sorting waste, as expressed by a discussion participant: “I lose time I can use to be working.”

Table 4.1 Knowledge of recyclable or reusable materials

Material	Recyclable	Reusable
	(% of survey participants)	
Plastic	91.2	88.0
Metal or tin	40.8	0.9
Glass	19.6	22.3
Cardboard	18.9	11.9
Paper	18.5	17.7
Food	2.7	9.4
Others	5.9	5.6
None	0.6	3.2
I don't know	6.2	3.6

Source: Original calculations for this publication.

Beliefs in the consequences of unsustainable waste generation and management also contribute to insufficient waste management behaviors. Only one-third of the survey respondents mentioned knowing it would help the environment. However, there is a prevalent association with public health consequences, which FGD participants indicated as the main reason for starting to sort waste: “I sort because of my health. Even if the government didn’t say anything, I know the importance of cleanliness.” Furthermore, a related major obstacle was the prevalence of a lack of shared responsibility and accountability. Only one-fifth of respondents mentioned themselves or their neighbors as responsible for waste management in Lagos. At the same time, the rest attributed the role to the local or national governments (45 percent) or the collection services (34 percent). This reflects a national sentiment captured by the Afrobarometer survey (2023), with one-third of respondents recognizing that the primary responsibility for reducing pollution resided in ordinary citizens. These results align with the general motivation to separate and reuse plastics. About 30 percent of survey respondents mentioned that they would sort since it helps the environment and 24 percent are motivated by knowing that plastic would be recycled. All the motivating factors for respondents are presented in table 4.2.

Table 4.2 Motivating factors to separate or reuse plastic and to separate food scraps

Response	Separate and reuse plastic	Separate food scraps
	(% of survey participants)	
It will help the environment	29.7	32.8
Knowing that the plastic waste would be recycled or reused	24.1	—
Knowing the benefits or consequences of doing it or not doing it	22.7	18.5
Knowing how to do it	18.5	27.5

Table 4.2 Motivating factors to separate or reuse plastic and to separate food scraps (contd.)

Response	Separate and reuse plastic	Separate food scraps
	(% of survey participants)	
Knowing that waste will be collected at my doorstep	16.3	13.9
Knowing that the sorted waste would not be dumped in the gutter or streets	7.8	10.9
Receiving a reward or prize	6.9	5.6
Receiving a penalty or fine for not doing it	3.2	3.7
Having space outside my home (space, odor, convenience)	2.6	7.3
Other	4.3	3.1

Source: Original calculations for this publication.

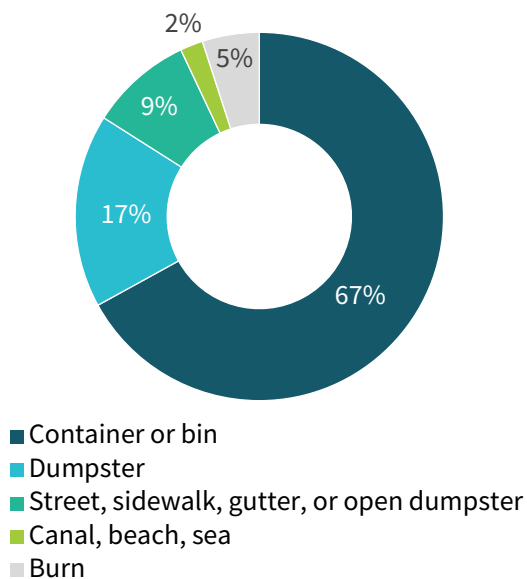
However, 32 percent of the respondents are unaware of what happens to their waste after disposal. Only 27 percent indicated that the waste is taken to landfill, while 20 percent stated that LAWMA or PSP workers sort all the waste, and 18 percent think waste is burned. Results reveal an opportunity to show residents what happens to waste when it is sorted or not sorted, and properly disposed of, which can increase their motivation to perform such behaviors. Besides plastics, which most of the respondents, that is 82 percent, knew could be reused or repurposed, most were unaware that paper, cardboard, food waste, glass, and metal or tin could be reused.

Only 18 percent of the respondents sorted their waste in the seven days preceding the survey, with a higher prevalence in higher-income households (22–25 percent) and those with formal waste collection (23 percent). The reasons for not sorting their waste were mainly that they had never sorted waste (42 percent) or did not have time (41 percent). Fewer people did not know why they should sort waste (20 percent). Among those that sorted their waste, 35 percent indicated that they sometimes forgot to do so, while 65 percent had never failed to sort. This suggests that those who sort waste will always try to follow through as a habit. Acknowledging these households as environmental champions can help induce similar behavior, as has been suggested by relevant literature on social norms and influential figures (Salmon et al. 2015; Scalco et al. 2017; Tong et al. 2018). Regarding the type of materials, they sort and reuse, during the IDIs and FGDs, participants mentioned that they mostly reuse plastic bottles to sell other things such as palm oil, fuel such as kerosene, and yogurt.

4.3.5 Disposing of Waste: Barriers to Sort and Dispose

The study found that appropriate options for waste disposal are not readily available to all citizens. While most survey respondents dispose of their waste adequately in front of their house for third-party collection, that is, 67 percent, as shown in figure 4.3, and pay for the service (93 percent), many study participants (16 percent) employ non-sustainable disposal options, including dumping household waste in the streets, drains, and rivers or burning it. Furthermore, from those with access to collection services, in 28 percent of the cases, cart pushers collect waste informally. These results emphasize that 46 percent of waste remains mismanaged in Lagos, even as multiple

Figure 4.3 Household waste disposal method



Source: Original calculations for this publication.

approved channels for disposal are available at the municipal level. Habituation and default actions were identified as significant contributors to inadequate disposal. However, lack of consciousness regarding the adverse effects of waste burning and littering is another relevant motive to poor management: about one-third of group interviewees mentioned that litter does not affect them, and 90 percent believe their community has no waste-related issues. Among those who acknowledge the negative consequences of lousy disposal, several reasons were listed, such as litter blocking drainages, causing mosquito, cholera, and heart diseases. For example, one FGD respondent mentioned: “Plastics block our drainages, and then that causes mosquitos.”

Many respondents manifested a lack of awareness and access to waste services as reasons for littering. Less than 10 percent of

survey participants received information about waste in the past month, with even lesser exposure for households without access to collection services, with informal services, and from the poorest expense quintile. Among those who received information, the majority (76 percent) received information through radio, 21 percent through television, 20 percent from family and friends, while none of them received information through NGOs or social media. Other sources included newspapers or magazines and landlord associations.

The visibility of signs of poor waste management in the community and the prevalence of social norms also played a role in the harmful practices at home. For instance, more than half of survey participants (54–67 percent) mentioned seeing waste dumped in the streets, gutters, and other public areas, with an overwhelming majority of it being plastic (over 90 percent were plastic bottles, water sachets, and wrappers). Also, 17 percent of respondents mentioned that there is no regulated dumpsite in their community and that people dump waste anywhere. Furthermore, when asked how neighbors dispose of their waste, interview participants mentioned official collection by the local authority and unsustainable practices such as burning or littering, using this as an argument for littering themselves. This detachment is reinforced by the lack of responsibility or control over the waste challenge mentioned in the previous section and the sense of no immediate punishment or consequences for littering.

Behavioral barriers were matched with other significant barriers regarding inadequate waste collection and disposal infrastructure identified by participants. Insufficient waste collection trucks and insufficient storage capacity for collected waste were reported, as were the lack of sorted dumping sites and bins and the absence of recycling companies. Informal waste pickers were found to collect only certain types of waste with varying frequencies, leaving some materials uncollected. In general, interviewed waste pickers mentioned a stigma associated with their work. For example, one interviewee said: “People attached a stigma to my work. They nicknamed me Lyanbola.” Therefore, relying on informal waste collection is not a mainstream practice. However,

the availability of community recycling was noted as a potential solution, and there is an overall positive sentiment toward waste collection services (65 percent satisfaction), especially from higher-income households.

Survey responses reveal high variability in the amount and frequency of fees charged. The average amount charged was ₦859, with the majority (64 percent) charged monthly. About 26 percent of respondents were charged weekly, five percent twice or more weekly, 4 percent every two weeks, and 1 percent daily. A minimal amount (3 percent) of respondents were charged in other ways, including when the waste bag was full or at no time.

Regarding public littering, most respondents (67 percent) saw waste littered in the street, in front of their houses, or dumped in the gutter. Other places include roadsides (66 percent) and marketplaces (54 percent). About 39 percent of the sample believed that people litter in the streets, gutters, canals, rivers, and the seas as a habit, and 30 percent believed it was because there are no bins and dumpsters for disposal. Furthermore, 56 percent of the respondents believed more wastebins should be provided on the streets to stop littering, and 31 percent believed that charging a less expensive waste collection fee could help reduce littering in Lagos communities. Increased collection frequency and enforcement of penalties were also mentioned.

Lastly, respondents were asked about their level of agreement with a set of statements about waste management in Lagos. The results are presented in figure 4.4. First, in terms of consequences of poor waste management, 98 percent of the respondents agreed that dumping waste on the street or gutter is unfavorable for the community and 96 percent consider that it can cause health issues. As for the expectations from the community, barely 20 percent believe their neighbors expect them to litter on the street, canal, gutter, or the beach; and only 36 percent agreed with that most of their neighbors' litter. Lastly, 70 percent mentioned they reuse or recycle plastic waste such as plastic bottles or nylon bags and only 37 percent stated that they do not know how to reuse this plastic waste.

The survey also found that there was a link between a household's level of expenditure and access to waste management services and household practices like sorting, as discussed in box 4.1.

Figure 4.4 Agreement level on waste management issues (%)

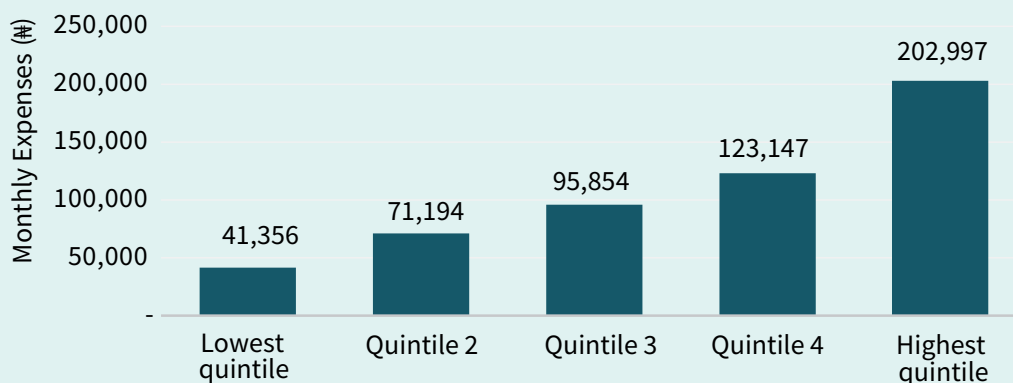


Source: Original calculations for this publication.

BOX 4.1 WELFARE LEVEL AND WASTE MANAGEMENT

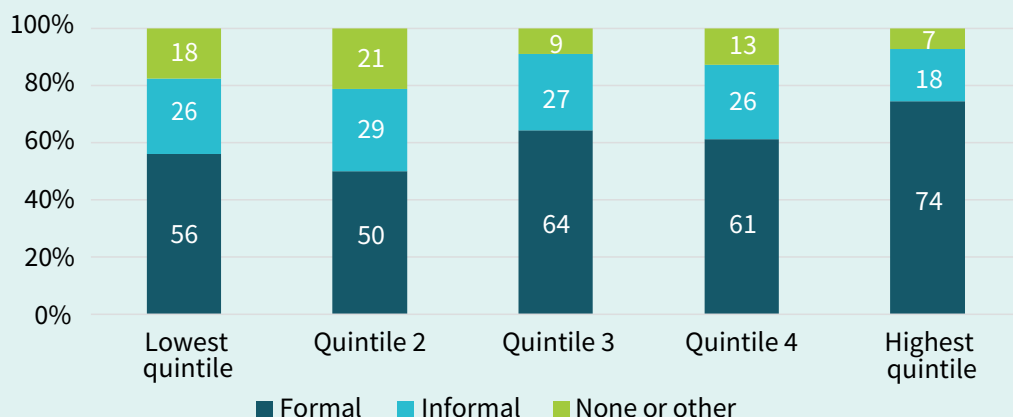
Welfare distribution was assessed by creating expenditure quintiles based on the total household monthly expenditure provided by respondents of the waste management survey. The aggregate expenditure included nine categories: medical expenses, utility bills, social activities and entertainment, fuel, airtime, education, transport, rent, and food and groceries. Figure B4.1.1 shows the distribution of total monthly expenditure among respondents.

Figure B4.1.1 Distribution of total monthly expenditure



Source: Original calculations for this publication.

Figure B4.1.2 Access to waste collection services



Source: Original calculations for this publication.

Access to waste management services, depicted in figure B4.1.2, shows an unequivocal wealth gradient, with households from the highest level of expenses having more formal waste collection by LAWMA or PSPs and, conversely, lower access to informal collection (cart pushers) or lower likelihood of not having collection services at all. Not surprisingly, the overall satisfaction level with waste collection service is higher for top quintiles: 66 and 64 percent of households in quintiles 4 and 5 are satisfied. The bottom quintile exhibits lower satisfaction level at 44 percent and the highest dissatisfaction at 54 percent.

BOX 4.1 WELFARE LEVEL AND WASTE MANAGEMENT (contd.)

At home, households also exhibit different practices according to their wealth level. For example, on average, respondents from the top and bottom quintiles have two waste containers for discarding waste at home, compared to one for quintiles 2, 3, and 4. When respondents were asked how they collect waste around the house, most put waste in a bag or a dustbin to collect. However, most lower quintile households use a plastic bag (76 percent), while dustbins and buckets are more prominent in the rest of the quintiles, at approximately 50 percent.

Furthermore, the top quintile has a much higher waste sorting level than the other households along the expenditure distribution, mainly the bottom 20 percent. As such, one out of four top welfare households sort their waste, compared to 22 percent for quintile 4, 18 percent for quintile 3, 16 percent for quintile 2, and 8 percent for the bottom quintile. And although the main three reasons across the distribution are all related to a perceived lack of time, experience, and motives for sorting, their prevalence varies: for half of the bottom quintile, lack of time is the most prevalent, while for the highest quintiles it is not having done it ever before. Key reasons cited by survey respondents for not sorting waste are summarized in table B4.1.1.

Table B4.1.1 Reasons cited by respondents for not sorting waste

Main reasons for not sorting waste	Lowest quintile (%)	Quintile 2 (%)	Quintile 3 (%)	Quintile 4 (%)	Highest quintile (%)
I don't have time	53	38	39	35	36
I have never sorted	32	52	48	43	36
I don't know why I should sort	21	20	16	24	22

Source: Original calculations for this publication.

Lastly, the knowledge about which materials can be recycled is highest for higher-income levels. Furthermore, households in the bottom quintile consistently have lower knowledge of the recyclability of primary materials and, consequently, score lower in a waste sorting task. Quintiles 4 and 5 know more about cardboard and metal as recyclable items than the bottom quintiles. Similarly, regarding which materials can be repurposed or reused, respondents across income know about plastic and metal, but fewer know about paper, cardboard, and glass.

4.3.6 Mobilization

A high proportion of respondents (71 percent) were unaware of waste management initiatives in their communities and the city. Only 27 percent of the respondents were aware of the Cleaner Lagos Initiative (CLI), less than 1 percent were aware of the Oniru beach adoption and cleanup, 1 percent were aware of 'Lagos at 4 am' initiative, and 2 percent were aware of the blue box program and 'Adopt-a-bin' program. As a result, 87 percent had never participated in any of the initiatives. Only 11 percent of respondents indicated participating in CLI, while 1 percent participated in the blue box program. Although most respondents were willing to participate in any activity, 30 percent indicated that they would not, due to lack of time.

When respondents were asked if they would use an app or platform to notify collectors to get waste collected at their door, 72 percent indicated that they would like to use the app. Only 28 percent did not want to use any app. This suggests that introducing a waste management app to facilitate waste management in Lagos could help. Already some recyclers use the PAKAM app to collect plastics from their clients in Lagos. However, this app may not be known widely.

4.4 RECOMMENDATIONS

Waste management practices are intricately linked to the social and physical environment in which they are implemented. In Lagos, the absence of reliable infrastructure, such as public bins or containers, coupled with intermittent collection services, has shifted social norms toward littering and open dumping. The results show that 67 percent of survey respondents acknowledge that they frequently encounter littered waste in the streets or gutters, clearly portraying how habituated people are to seeing litter in their communities.

In this context, we present a set of 11 recommendations to address the most pressing behavioral barriers documented in the previous section. The ideas are based on insights from behavioral science that have been successfully applied in other settings and policy challenges with positive results. Table 4.3 provides a summary of the diagnosed barriers and proposed recommendations.

4.4.1 Tackle the Lack of Awareness Through Social Learning

Channels of communication through which information was received included radio, television, family, and friends. These channels should be leveraged more effectively, along with community associations and social media, to provide information on responsible waste management.

4.4.2 Fight Bandwidth Constraints by Simplifying Information

To improve awareness and knowledge of the benefits of sustainable behaviors, communication materials should include simple information on how the waste management system operates and households' contribution when handling waste properly. Cleanliness and health are two aspects that Lagosians mentioned when thinking of the consequences of proper waste management. Therefore, messages should tackle concrete issues that waste can bring in these two aspects. People are not motivated by being called out on their shortcomings and failures. Therefore, instead of guilt, which can cause defensiveness and disengagement, we recommend leveraging positive emotions to elicit engagement (Schneider et al. 2017).

Sometimes people want to behave more sustainably, but they may not know how to do it or may find it complicated. Concrete examples of sustainable actions should be included in communication materials, such as reusing plastic bottles to make plant pots or refilling them with cleaning products, medications, and oils and outlining concrete reduction behaviors, for example, buying water gallons instead of small sachets or bottles and food by weight with reusable containers instead of packaged food.

4.4.3 Reach the Target Population Promptly

The timing of these communications is also of extreme importance. Communication materials should convey the message when deciding to consume plastic packages and products and when consuming and generating refuse. For example, one of the most crucial reasons for not sorting waste was not having the habit. Habits are strong determinants of behaviors and contextual cues are essential tools to shift them. Having salient separate bins for recyclables in convenient places can help people remember to sort when disposing of their waste. To change a habit, one needs to call people's attention immediately and provide alternatives to their behaviors. Communicational materials next to bins can help with that. Salient messages should be included in high-traffic locations, that is, markets, shopping, churches, and schools, where people tend to consume products or litter, simplifying their decisions by stating clearly where each type of waste goes in each bin.

4.4.4 Reduce the Hassle of Being Sustainable by Improving Accessibility

Even messages leveraging behavioral science concepts are ineffective if sustainable consumption and disposal options are not conveniently available (Almosa, Parkinson, and Rundle-Thiele 2017). In the case of Lagos, for example, households do not have readily available alternatives to plastic products, as with drinkable water provision, which is currently inaccessible to most residents without plastic packaging. In this context, we recommend focusing on reusing and reducing actions. The availability and convenience of buying sustainable options in shops and markets are crucial to promote these last behaviors. The government should reduce the burden of choosing sustainable packaging and decrease the convenience of plastic use. For example, 63 percent of households in Lagos discard nylon bags from purchases. Box 4.2 shares the example of a Nepalese city that saw a substantial increase in waste disposal practices by residents after they were provided with well-located wastebins and information on proper disposal.

BOX 4.2 COMPLEMENTING INFRASTRUCTURE IMPROVEMENTS WITH ESSENTIAL INFORMATION

In 2017, researchers in the Nepalese city of Bharatpur assessed the influence of low-cost infrastructure and behavioral tools on waste disposal practices. The study implemented a randomized controlled trial, wherein 75 communities received 1,500 strategically located 20 litter street wastebins and information on waste disposal (pamphlets, posters, and workshops). A control group of 75 communities did not receive the intervention. Over six months, the provision of wastebins and information increased neighborhood cleanliness by 34 percent and proper waste disposal by 13 percent relative to baseline

Source: Nepal et al. 2023.

4.4.5 Promote Behaviors by Altering the Choice Architecture

A crucial step to stop plastic waste generation is changing consumers' default options from plastic to fabric or paper bags. Behavioral scientists call this modifying the choice architecture (Thaler et al. 2013). One option is restricting plastic bag use, as 34 African countries have done with the introduction of regulations ranging from a levy to commercializing or a ban on their production, import, export, and use.²² Although some of these regulations were established almost two decades ago, their effectiveness is inconsistent mainly due to their complexity and scope, the strictness of the consequences, and problematic enforcement and implementation (Kibii 2021). Nigeria is one example of a country with a relatively minimal impact of plastic bans. In 2019, an attempt was made to revamp a prohibition on the production, import, and usage of plastic bags initially introduced in 2013, but the proposed legislation has not been passed by the parliament. Beyond plastic bans, companies such as Unilever, Nutri, and Coca-Cola have already started piloting refillable stations and package-less delivery in some markets (ABS CBN News 2020; Coca-Cola Company 2019; Unilever 2019). These examples can be adapted in Nigeria to provide alternatives to citizens when buying their daily products.

4.4.6 Change Mental Models and Preconceptions with Role Models

Only 18 percent of the respondents sorted their waste in the last seven days preceding the survey. However, among those that sort their waste, 65 percent have never failed to sort their waste. This suggests that those who sort waste will try to follow through always. Sharing information about their practices with peers and neighbors may encourage waste-sorting behavior in others. We recommend using these positive deviants to promote new social norms toward waste management in different communities.

4.4.7 Fight Inattention and Procrastination Using Reminders

There seems to be general satisfaction with the waste collection services for which most people pay. We recommend that the waste management authority uses the services collection bills as an entry point to communicate relevant messages to households. LAWMA and PSPs could send timely reminders to households to dispose of their waste when they are about to collect waste, increasing awareness and targeting a specific action at the right moment to avoid waste disposal during incorrect times of the day.

4.4.8 Increase Pro-Social Behavior with Empathy

Informal waste pickers are part of the waste management ecosystem in Lagos. However, their communication with households is almost nonexistent. We recommend strengthening their role and communicating to households the work waste pickers perform and their contribution to the environment and cleanliness of the city. Fostering empathy between these stakeholders can

²² According to Greenpeace Africa (2020), the list of countries includes Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, the Republic of Congo, Côte d'Ivoire, Djibouti, the Democratic Republic of Congo, Ethiopia, Gambia, Gabon, Guinea-Bissau, Eritrea, Kenya, Madagascar, Malawi, Mali, Mauritania, Morocco, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe.

increase feelings of reciprocity and elicit motivation to contribute to sustainable practices. Already some recyclers use the PAKAM app to collect plastics from their clients in Lagos. However, this is not known widely. We suggest using this app as an entry point to connect recyclables collectors to households. Box 4.3 describes the impact of positively framed information on waste disposal behavior in an Argentinian municipality.

BOX 4.3 REFRAMING INFORMATION WITH POSITIVE EMOTIONS

In the Argentinian municipality of Trelew, researchers tested the impact of communication materials on waste disposal behavior. They assessed the impact of letters and magnetic calendars with simplified recycling information on source segregation rates of 4,800 households and small businesses. Some of the messages appealed to the connection of households with waste collectors, expecting to raise awareness and empathy toward the latter's hazardous and challenging job. The intervention doubled household source segregation rates, and the effects remained even after six months. Following this, the local government, scaled up the trial to a broader section of the municipality. The intervention informed subsequent community engagement strategies.

Source: Pegels et al. 2022.

4.4.9 Involve the Community Using Monitoring and Gamification

Social figures and norms tend to influence people's behaviors even when they are unaware (BIT 2014). In Lagos, 19 percent of the households consider that the main reason for littering is because "everyone does it," a significant percentage state that it is a habit, and most households are unaware of programs or initiatives for waste management in their communities. Also, as mentioned, 67 percent of respondents have found waste littered in their community, evidencing that people have normalized this behavior. Recommendations to counteract the normalization of littering and open dumping are to create community initiatives with high visibility, taking advantage of the low current participation but high willingness. These types of activities can be successful in building awareness (Cotterill et al. 2009). Finally, public accountability is a tool that can promote behavior change. We suggest using community associations to monitor the waste management practices of each LGA and a comparison mechanism to gamify the experience using contests and public rankings.

Another positive experience of public accountability comes from the Umuganda practice in Rwanda, whereby citizens of adult age perform community work once a month, including community cleanup activities. The high citizen engagement from this initiative has led to a positive perceived impact on the environment and cleanliness of the communities (RGB 2017). Box 4.4 gives an example of the UK government's efforts to promote accountability in its offices through social comparison.

BOX 4.4 PROMOTING ACCOUNTABILITY THROUGH SOCIAL COMPARISON

In 2010, the UK Government published monthly performance tables showing individual departments' energy consumption. Each department's Permanent Secretary was held accountable for its performance in meeting with the Cabinet Secretary to introduce a competitive element. Over a 12-month period, the government saved 10 percent in carbon emissions.

Source: Cabinet Office Behavioural Insights Team 2011.

4.4.10 Frame These Changes as a Fresh Start

The design of community events can further benefit from applying behavioral tools to increase the probability of behavior change, for example, by applying the *Fresh Start* effect to frame the proposed activities (Dai, Milkman, and Riis 2014). This concept assumes that transition periods make us more susceptible to change as it gives us a psychological sensation of a new beginning, making us more likely to form aspirations and take steps toward a goal. Therefore, we recommend presenting community cleanups as contributing to a 'New, Cleaner Lagos'. In addition, using community leaders (*Obas Baales*) can make people more receptive to messages. The survey results show that households consider proprietors (43 percent), community associations (44 percent), politicians (25 percent), and religious leaders (8 percent) as influential figures. Most respondents also indicated they would participate in community cleanup if the leaders participated. This finding suggests that the leaders could be used to mobilize communities for waste management.

4.4.11 Use Reciprocity to Involve the Population

Humans have an innate inclination to reciprocate when they perceive either present or future advantages of such actions or when there is a moral obligation to contribute to the common good. Currently, households in Lagos believe that the responsibility to improve waste collection relies on the government and waste management authorities, which should provide bins on the streets and regular service. Only one-fifth of respondents in our survey mentioned themselves or their neighbors as responsible for waste management in Lagos. At the same time, the rest attributed the role to the local or national governments (45 percent) or the collection services (34 percent). Before urging people to alter their behavior, it would be beneficial to demonstrate positive actions by the government to stimulate reciprocity among stakeholders and instill the idea that everyone has a role to play in finding a solution, thereby enabling fundamental change. Government efforts to mitigate the negative environmental impacts of waste should be displayed prominently.

Table 4.3 Behavioral bottlenecks to domestic waste management in Lagos and proposed levers

Levers	1. Social learning	2. Simplifying information	3. Timing	4. Accessibility	5. Choice architecture	6. Role models	7. Reminders	8. Demonstrations	9. Monitoring gamification	10. Fresh start framing	11. Reciprocity
Barrier	Waste sorting demonstrations in community venues	Action-focused information on waste sorting and disposing	Messages targeted at shoppers before shopping	Bins in high transit areas or accessible, sustainable products	Removal of plastic bags at shops to change the default	Inspirational quotes and images from <i>Obas Baales</i>	SMS or utility bill reminders from waste management authority or collectors	Demonstrations by informal waste pickers	Community as monitoring and accountability agent and competitions like 'The greenest LGA'	<i>Fresh Start</i> messages during new community initiatives	Demonstrate positive actions by the government
Lack of awareness	✓		✓			✓	✓		✓		
Bandwidth constraints ^a		✓	✓	✓	✓		✓		✓		
Inattention			✓		✓		✓		✓		
Social norms ^b	✓					✓		✓	✓		
Mental models ^c	✓					✓		✓	✓		
Overweighing negative experiences ^d						✓			✓		
Unobserved consequences or present bias ^e	✓	✓	✓		✓			✓	✓		
Low confidence to change						✓			✓		
Lack of commitment		✓		✓					✓		
Procrastination		✓		✓			✓		✓		

Source: World Bank.

Note: LGA = local government area; a. Bandwidth constraints refer to the fact that, when buying, too many options and stimuli reduce cognitive bandwidth and thus people's ability to evaluate rationally all options (Tversky and Kahneman 1981); b. On social norms, refer to the influence of the perceived informal rules that define acceptable and appropriate actions within a given group or community (Farrow, Grolleau, and Ibanez 2017); c. Mental models are representations of how something works in the real world. In this case, we refer to the representation of who should manage waste in Lagos and how (Atran, Medin, and Ross 2005); d. Participants in the study manifested weighing more the hassle of behaving in a sustainable way (for example, buying sustainable products, sorting, composting) than the environmental benefits of doing it so; e. Present bias is the tendency to focus more on the present situation than the future when making decisions, giving more prominence to present needs, and not considering the future consequences of present actions (O'Donoghue and Rabin 2015).

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CHAPTER 5

FINANCIAL AND ECONOMIC ANALYSES OF MSW IN NIGERIA AND LAGOS STATE

Further information on this topic is available at:
Improving Solid Waste and Plastics Management in Lagos State: An Economic Analysis (Internal report) and *Improving Solid Waste and Plastics Management in Lagos State: An Analysis of the Solid Waste Sector* (Internal report).

Provision of efficient solid and plastic waste management services while also ensuring financial viability of the system is important, but it is a great challenge for many developing countries including Nigeria. This chapter presents an economic and financial analysis of solid and plastic waste management systems in Nigeria and Lagos State. Sections 5.1 and 5.2 discuss the need and challenges for financing and solid waste management (SWM) in Nigeria, including the cost of mismanaged waste.

5.1 FINANCING FOR SWM IN NIGERIA

The Nigerian water supply, sewerage, waste management, and remediation sector grew by 4.92 percent in Q4 2022, according to Nigeria's National Bureau of Statistics. The sector's contribution to total real GDP was 0.17 percent in the fourth quarter of 2022; higher than its contribution of 0.16 percent in the same quarter of the previous year (NBS 2022). This highlights that the combination of the water supply, sewerage, and waste management economic streams in the country has recorded sustained growth and contributed to Nigeria's GDP in recent times.

Several sources of waste management financing have been officially acknowledged by the Federal Government of Nigeria, such as government annual budget allocations, funding from donors, sector user charges, private sector participants, and ecological funds allocated to all tiers of government, investments, fines, and levies.

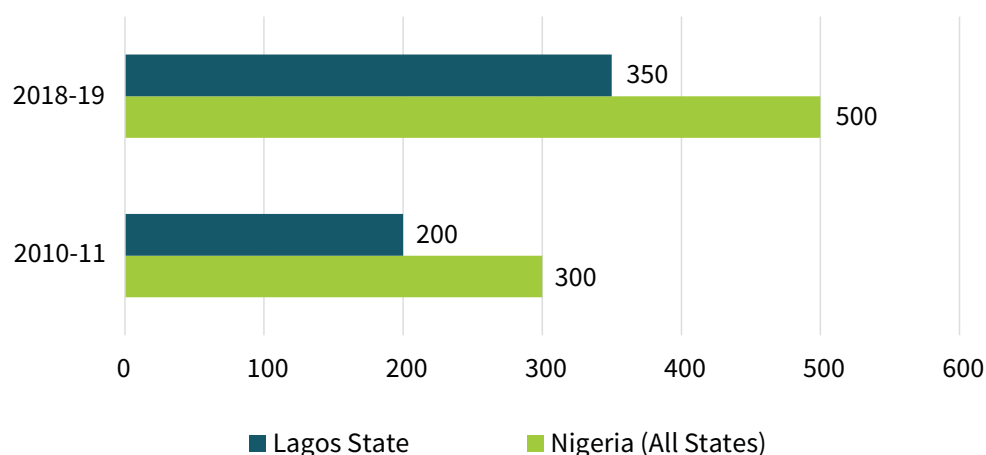
5.2 CHALLENGES

Financing is the backbone of SWM. Although waste management is an economic activity, it is also a public service that requires financing for cost recovery and sustainability. Collection rates typically determine the ability of the sector to function well. Regardless of the sources of funds, adequate financing is essential to run any type of waste management system. The various challenges in sector financing are broadly classified as overreliance on public finance mechanisms, limitations in private sector participation, and inadequate cost recovery. Each of these is discussed in more detail below.

5.2.1 Overreliance on Public Finance Mechanisms

An important source of financing for SWM is user fee collected from households, enterprises, and institutions. As shown in section TS1.1.1.6, the proportion of households with access to formal waste collection in Nigeria is extremely small—11 percent (of which 5 percent collected by a private firm, 4 percent collected by the government, and 2 percent accessed government bins). The remaining 89 percent either throw away waste informally in the bush, street or burn it. Figure 5.1 shows that the median household among those who use formal solid waste disposal facilities was only ₦500 per month in 2018–19. Given the proportion of households that use formal solid waste disposal facilities and the amount they pay is low, it is evident that user fees do not cover a meaningful portion of the cost of SWM.

Figure 5.1 Monthly payments for refuse collection services, 2010–11 and 2018–19 (₦)



Source: World Bank 2024b.

Government policies, such as the *National Policy on Plastic Waste Management (NPPWM)*, place the responsibility of funding plastic waste management on the public sector. Since waste management is prioritized after several other sectors such as healthcare, education, and energy, the amount of budget allocated is at the sole discretion of government officials and is occasionally diverted to other uses deemed more exigent. Often, low-income countries' local administrations spend up to 20 percent of municipal budgets on municipal solid waste (MSW); in middle-income countries, such as Nigeria, it is more than 10 percent. However, in the Federal Capital Territory (FCT), only 2.43 percent of the annual budget was allocated for SWM, while in Lagos State the budget allocated to Lagos Waste Management Authority (LAWMA) is approximately \$43 million (1.7 percent of the total budget) in 2021. A similar trend is common in all 36 states of the federation. Thus, considering the background and the paucity of funds for government projects in Nigeria, a five percent budget provision would vastly improve the sector's performance.

The reliance on public funding for managing solid waste is unsustainable and lowers the quality of services. NPPWM has not set specific targets for funding the plastic waste value chain, investment, or operational costs. The funds allocated for waste management from state governments are spent on salaries, maintenance of equipment, and fuel, while little is spent on waste disposal. Local governments in Nigeria are indifferent about the policy and practically uninformed about it.

Local government areas (LGAs) also face difficulties in raising funds and collecting taxes, while elected representatives are not willing to create new tariffs or fees. Limited budgets have lowered the capacity of the agencies concerned to carry out SWM effectively and have also lowered their morale because of poor remuneration.

Public financing for SWM remains limited and is mostly used for basic sweeping and cleaning activities. At the city level, MSW infrastructure is predominantly funded by intergovernmental fiscal transfers from the federal and state governments, with limited contributions from LGAs due to their constrained fiscal situation and limited revenue generation capacity. However, LGAs have absorptive capacity constraints and limited capacity to plan, budget, and finance integrated waste management systems and infrastructure. Most of the available resources are used to finance waste collection and public space cleaning/sweeping activities, while key infrastructure needs remain

unaddressed. Financial sustainability and cost recovery mechanisms for waste management across cities remain limited as there is no uniform user charge framework for cost recovery of waste management services and subsidies are provided in an ad hoc manner.

5.2.2 Inadequate Cost Recovery

For effective SWM, a clear, effective, and sustainable funding mechanism must first be in place. The national tariff strategy for the MSW sector in Nigeria is unclear, and the *National Policy on Solid Waste Management* (NPSWM) 2018 does not assess the need to establish a national system that incentivizes local authorities to implement tariff strategies at the local, regional, or state levels. The introduction of cost recovery tariffs would enable LGAs to fund the maintenance, renewal, and expansion of solid waste infrastructure.

In Nigeria, the average household affordability is low. Given the costs of providing the service, particularly as more sophistication is introduced in the waste treatment mix, it is essential to ensure that cost recovery is built into service provision arrangements and that fees remain affordable and are collected.

5.2.3 Limitations in Private Sector Participation

The role of the private sector in solid waste collection in Nigeria is limited. Section TS1.1.1.6 shows that the proportion of households that dispose of their solid waste using a private firm remained constant (about 5 percent only) between 2010–11 and 2018–19. There are several reasons for this. The primary reason is that the private sector is fragmented and hence unable to play a consistent role in the waste value chain due to various factors such as the predominance of informal sector players and medium enterprises lacking financial and technical capacity for scaled operations, challenging regulatory and political environment that tends to discourage scaled private sector investments or public-private partnerships (PPPs), and lack of enabling regulations to unlock market opportunities for waste commercialization and recycled products. Most of these private businesses require significant capital investments that are difficult to access on long-term repayment plans. Minimal returns on investment (RoIs) from such businesses also make them unattractive, especially when government policies are not targeted at creating favorable markets for specific products and supporting long-term investment. Therefore, with limited financing from the public sector and hesitation from the private sector, waste management financing suffers significantly in Nigeria.

5.3 FINANCING WASTE PROJECTS

For effective SWM, a clear, effective, and sustainable funding mechanism must first be in place. Second, developing a roadmap outlining alternatives to disposal in dumpsites and landfills is essential, since material and energy recovery facilities are necessary for creating value from waste. Waste project financing requires LGAs to address the following issues:

- **Promotion of segregation of waste at source**
- **Expansion of service coverage areas**
- **Better planning and enabling policy reforms**

- **Access to controlled disposal sites or plans to upgrade existing ones.**

Full cost accounting is the foundation of financial sustainability and is critical in the delivery of effective and efficient waste services. A national spreadsheet-based tariff setting model with guidance for local authorities would provide a framework for financial sustainability. The government is encouraged to set waste fees after consulting key businesses or industries based on a shared interest in improving the MSW system and affordability. In addition, it is important to keep in mind the affordability of basic waste removal services. Vertical equity with broader pro-poor policies when setting tariffs is important, and the implications of free basic services need to be evaluated.

At the national level, guidelines can be set to inform commercial and industrial waste tariffs by states and local authorities. These should be set within a common national framework, introducing a concept that is uncommon but easy to implement: apply user charges according to the type of business, for example, a restaurant pays more than a small café; a basic fee in the form of a flat rate, relatively easy to implement in the formal sector, where waste removal and public cleaning services are important. The informal sellers could also pay a fee for waste services, as they also benefit from having a tidy surrounding environment.

5.4 FINANCING FOR PLASTIC WASTE

Financial sustainability is vital to eliminate plastic leakage into the environment and to set Nigeria on a path toward resource efficiency and circularity. It is an essential building block of a service delivery system where no plastic waste leaks into the environment, through a combination of sound disposal, recycling, and reuse, and overall, through more efficient use of resources. Robust finances are essential to ensure that infrastructure, operations, and maintenance of the system can be sustained over time.

The main operational cost of items in the Nigerian plastic waste value chain can be broadly categorized into labor, electricity, purchase or rent of land, machinery, and transportation. Some of the major challenges for plastic waste financing in Nigeria include the following:

- **High capital requirement:** The financial investment required to establish a business in plastic recycling and treatment is quite high, especially when compared to access to financing for such businesses.
- **Low valuation of plastics:** From interactions with stakeholders, it was found that most companies are not able to collect significant quantities of plastic waste from the market, and only one major beverage company in Nigeria was able to collect plastic 20,000 metric tons (MT) of packaging annually. Since neither extended producer responsibility (EPR) nor mandatory recycled content regulations have been enforced in the sector, manufacturers have not yet completely embraced the use of recycled plastics for their product packaging.
- **Value added tax (VAT):** Businesses involved in plastic recycling and treatment in Nigeria are currently taxed on their transactions, further reducing their meager profits. For instance, a 7.5 percent VAT has been applied to all plastics sold by Wecyclers.
- **Import duties, tariffs, and logistics:** Most equipment needed for plastic waste collection and

recycling is not easily available at fair prices locally and, hence, is imported from countries such as China. This equipment can be expensive, and import duties and tariffs pose additional financial constraints on businesses in the waste sector. Costs pose a major challenge, as it can take extended periods to be covered and often require up-front financing.

5.5 FUNDING FOR PLASTICS

Private sector participation and financing in plastic waste management have tremendous potential but will remain limited until concerted interventions are made across the supply and demand ends of the value chain. There are multiple bottlenecks across the plastic waste value chain that constrain the participation of private sector companies in the operation and financing of plastic waste management systems. Limited pipelines of sizeable and financially viable investment opportunities (for example, sorting, recycling, and resource recovery facilities), combined with narrow local government experience in structuring and managing contracts with private sector operators, constrain engagement opportunities for national and international private companies.

5.6 FINANCING MSW SECTOR IN LAGOS STATE

SWM in Lagos State is financed by annual financial allocations from the state and local governments. These allocations go primarily to LAWMA, though some allocations also go to Lagos State Ministry of Environment (LS-MoEnv), Lagos State Environmental Protection Agency (LASEPA), and other agencies for their respective roles related to MSW within the state. In 2021, the state allotted ₦19.98 billion to LAWMA for MSW and another ₦561 million for the public-school waste program. The state government also spent ₦2 billion for funding an extensive dumpsite rehabilitation project in 2021.

In 2020, LAWMA spent ₦17 billion on waste management in the state, which is 46 percent more than the expenditure incurred in 2019, and in 2021 the budget was ₦19 billion. Both the actual and budgeted expenditure for waste management in Lagos State has increased significantly since 2019, highlighting the positive shift. Although the budget for MSW has increased, it still accounts for only 2.1 percent of the total recurrent expenditure. The World Bank has recommended 10 percent of monthly recurrent expenditure as an optimum budget for managing solid waste in developed countries with adequate infrastructure, while it is 15 percent in developing countries, including Nigeria, which need infrastructure improvements.

A review of the budget performance over the last seven years as of 2022 indicates that recurrent expenses for waste management in Lagos State are significantly higher than capital expenditure and only 26 percent of the expenditure in 2020 was spent on capital items while the remaining 74 percent was spent on recurrent activities such as overhead costs. Hence, most of the allocated money from the budget is spent on current operations and less on developing new infrastructure and expanding service coverage. This is atypical of developing cities which spend more on waste collection and transportation and less on waste recovery and treatment.

The capital intensiveness of MSW coupled with the limited budget allocation from the government has warranted the mobilization of resources from private and public sector players as well as local and international development partners:

- Annual permit/license fees collected by LAWMA from private sector partnerships (PSPs)
- Fees paid by waste generators for the destruction and containment of expired product and products with other defects
- Fees, levies, fines, and penalties from violators of solid waste related regulations
- Bank loans to fund capital projects
- Grants from multilateral organizations, such as the \$94,000 grant from Coca-Cola Foundation to DoGood Africa for a waste-to-wealth sanitation project in Lagos
- Foreign investment, such as the \$150 million investment from WestAfricanENRG, a British firm
- Funds from international donor agencies, by aligning with their strategic priorities, for specific SWM projects/initiatives, especially in organizing capacity-building programs. Various bilateral initiatives are helping local governments to seek assistance for financing their development projects including SWM, such as with the World Bank, IFC, Foreign, Commonwealth & Development Office (FCDO) (formerly known as DFID), UNDP, and the Clinton Foundation.

Through these revenue streams, Lagos State is ahead of other state governments in the country, including the federal government, in waste management funding. Of these, the most significant and viable options for funding LAWMA and the private sector are state government budgetary allocations, user charges, private sector investments, and bank loans (World Bank 2024d, internal report).

5.6.1 Buoyancy of Funding Sources for Waste Management and PPP in Lagos State

Funding and investments for the MSW sector in Lagos State are insufficient to handle the waste volumes generated in the state. Pay-as-you-throw and EPR practices meant to shift the cost of waste management to the generators have not been implemented yet. Flat waste user charges may be convenient for fee collection; however, they are not flexible enough to improve cost recovery. While grants are up to the discretion of external funding parties, the 33 banks in Nigeria with a combined capacity more than ₦4 trillion can effectively fund investments in the MSW sector. It is recommended that LAWMA and the private sector utilize this robust channel.

5.6.2 Gap in Infrastructure and Funding

Lagos State needs an average investment of ₦58 billion annually to effectively manage its MSW, considering a 5 percent budgetary allocation for the MSW sector and ₦267.50 per person allocation (based on an expenditure model utilized in India, another densely populated developing nation).

The number of facilities and equipment for waste management in Lagos State was used to determine a funding gap of about ₦31 billion in the sector, specifically in capital investment, as shown in table 5.1.

Table 5.1 Estimated infrastructural and funding gaps in Lagos State, 2021

Component of waste value chain	Description	Prevailing situation in 2021	Ideal situation in 2021	Gap in capacity in 2021	Estimated gap in funding (₦, millions)
Collection and transportation	Total amount of waste collected daily (TPD)	7,000	13,000	6,000	—
Collection and transportation	Number of compactors/ collection trucks	920	1,961	1,041	25
Transfer stations	Share of total collected waste handled at TS (%)	10	50	40	—
Transfer stations	Number of TS	3	7	4	600
Vehicles for bulk movement	Average number of 30 MT/ trip trailer (or equivalent)	12	108	96	38
Disposal	Excavators for dumpsite management	1	4	3	86
Disposal	Bulldozers for dumpsite management	12	17	5	135

Source: Original calculations for this publication.

Note: MT = metric tons, TPD = tons per day, TS = transfer station.

5.6.3 Financing Private Sector Partnerships

The Lagos State Government provides support in the form of guarantees to the private sector to enable access to loans from commercial banks with a considerable payment plan. In 2021, through such government guarantees, First City Monument Bank granted a ₦3 billion loan to the Association of Waste Managers of Nigeria (AWAMN) facilitated by LAWMA, to boost the working capital of private companies to ensure effective waste management in the state. Private companies have purchased more than 250 compactors and 100 trucks using loans from financial institutions. It is important to note that most private sector companies in waste management in Lagos are startups with minimal financial resources, and this has led to limited participation and, sometimes, project failure.

These plans are expected to cost ₦50 billion from 2022 to 2025, and both the private sector and banks are interested in collaborating with LAWMA. The main challenge is the bureaucratic nature of decision-making at LAWMA. More transparency is needed in its operations, and the details needed by third parties to make investment decisions are not readily available.

5.7 POSSIBLE ECONOMIC IMPACTS OF IMPROVED MUNICIPAL SOLID WASTE MANAGEMENT SYSTEMS IN LAGOS STATE

The existing solid and plastic waste management system in Lagos State is proving costly. Solid waste, particularly plastic waste, has tremendous environmental consequences. It clogs drainage, increases the risk of flooding, endangers aquatic habitats, hampers income from tourism, fisheries, and shipping sectors and risks the health of the public and waste pickers and scavengers. The cost

of environmental degradation (CoED) due to poor SWM in three coastal states of Nigeria (Cross River, Delta, and Lagos) is estimated at \$453 million or 0.4 percent of the GDP of these three states (Croitoru et al. 2020). This results primarily from uncollected waste—leading to odors, marine pollution, and health problems—and improper waste disposal. However, this CoED figure underestimates the real impact of improper waste management, as it does not include impacts from groundwater pollution, microplastics, losses due to forgone opportunities of reuse/recycling or composting, health consequences from open burning of MSW, and exposure to toxic substances other than lead.

Approximately 4.75 million MT of waste is generated in Lagos city each year. Only about 70 percent of this waste, equivalent to 3.3 million MT per year, is collected and the remaining 30 percent, equivalent to 1.5 million MT per year, is freely disposed of in the environment. The annual social cost of uncollected municipal waste in Lagos State is estimated to be approximately \$218 million per year (Croitoru et al. 2020). Thus, the cost of each ton of waste uncollected is about \$153. Hence, immediate measures in terms of investment in MSW management and reduction in waste generation are required. This subsection builds on the previous chapters and analyzes SWM in Lagos State under alternative scenarios that are presented in table 5.2.

Table 5.2 Improved solid waste management in Lagos State (Alternative scenarios)

Scenarios	Expand MSWM capacity	Waste collected	Reduced waste	Uncollected waste (Cost in million per year)	Additional investment (Million per year)	Net saving (Million per year)
Scenario 1	0%	70%	0%	\$218	\$0	\$218
Scenario 2	25%	88%	0%	\$91	\$25	\$102
Scenario 3	40%	98%	0%	\$15	\$40	\$163
Scenario 4	25%	88%	10%	\$78	\$29	\$117

Source: World Bank 2024b.

Note = Municipal solid waste management.

Scenario 1 - Status Quo: Under the current waste generation and management system, Lagos State generates 13,000 MT of solid waste per day, which amounts to 4.75 million MT per year. Since 30 percent of the solid waste generated is not collected, it ends up in drainage systems and the coast. The state’s annual cost of uncollected solid waste is \$218 million.

Scenario 2: This scenario considers an increase of 25 percent in investment by the Lagos State Government to expand municipal solid waste management (MSWM). Considering \$30 per MT cost of waste collection, such investment will increase the total amount of waste collected to 88 percent with an additional yearly investment of \$25 million. Consequently, the cost of uncollected waste will be reduced to \$91 million per year. Investing \$25 million per year on MSWM saves \$102 million per year in damages from uncollected solid waste.

Scenario 3: This scenario considers an increase of 40 percent in investment by the Lagos State Government to expand MSWM. Considering \$30 per MT cost of waste collection, such investment will increase the total amount of waste collected to 98 percent with an additional yearly investment of \$40 million. Consequently, the cost of uncollected waste will be reduced to \$15 million per year. Investing \$40 million per year on MSWM saves \$163 million per year in damages from uncollected solid waste.

Scenario 4: Besides investment to expand MSWM by the Lagos State Government by 25 percent as in scenario 2, this scenario considers an intervention in the source of solid waste. Understanding how much households will reduce solid waste through what type of intervention requires the implementation of a carefully crafted policy experiment. A team of researchers in Nigeria is conducting such a policy experiment in Lagos State, and the results will only be available in a year. Drawing on previous studies conducted in similar set-ups, behavioral interventions could reduce solid waste per person by up to 10 percent through awareness campaigns assumed to cost \$0.25 per person year. Considering a 10 percent reduction in waste and investment of \$30 per MT per year on MSWM, the cost of uncollected waste can be reduced to \$78 million per year. Investing \$29 million per year on MSWM and behavioral interventions saves \$117 million per year in damages from uncollected solid waste.

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CHAPTER 6

ROADMAP RECOMMENDATIONS FOR SUSTAINABLE MSW IN NIGERIA AND LAGOS STATE



The preceding chapters reviewed the current state, challenges, and opportunities of SWM in Nigeria. This chapter outlines a pathway to achieve a circular economy through the sustainable management of solid waste in the country. This approach not only minimizes waste pollution and its multidimensional impacts but also turns waste materials into economic opportunities for job creation, innovation, industrial development, and social inclusion. Nigeria's capacity to realize this prospect seems currently at risk. Its underdeveloped municipal solid waste (MSW) sector is ill-equipped to manage the rapid growth in solid waste generation, estimated to double by 2040 to about 90 million metric tons (MT) annually. This situation will worsen the already high levels of waste pollution and its environmental and socioeconomic costs discussed in this report (topic sheet 3). It also highlights an urgent need for Nigeria to rethink its SWM approach and implement effective measures to address the gaps.

6.1. NATIONAL MSW ROADMAP RECOMMENDATIONS

Nigeria's large size and complexities posed by its political structure and sociocultural diversity constitute a major constraint to a national-level analysis of the solid waste sector and comprehensive interventions. Its 36 federal states and Federal Capital Territory (FCT) also have varied levels of institutional capacity, infrastructural development, and revenue profiles. Despite these disparities, however, the poor state of waste management and its underlying causes are similar across the states and Local Government Councils (LGCs) and can be addressed with similar policies, regulatory tools, infrastructure, and technical skills, allowing for appropriate local variations in implementation details. Accordingly, a set of key measures have been outlined in the national-level roadmap presented in table 6.1, which can be implemented broadly to strengthen what already exists and fill the identified gaps. The measures are structured under five thematic areas and are described in sections 6.1.1 to 6.1.6. A separate roadmap for Lagos State, in table 6.2, aligns with the aspirations expressed in the state's long-term development plan, that is, the *Lagos State Development Plan 2052*, and is discussed in section 6.2 of this chapter.

Table 6.1 Summary of recommendations to improve solid waste management (SWM) in Lagos State and Nigeria

Topic	Recommendation	Responsible institutions/ Stakeholders	Quick win/ ST/ MT/LT	Note
SWM in Nigeria	Reducing MSW generation by imposing binding targets on single-use plastics and introducing refundable packaging for beverages and protecting existing reusable glass bottles	FMEEnv	Quick win	Legislation at federal level involving packaging industry/retailers/brand owners
SWM in Nigeria	Ensuring financial sustainability of the sector, through EPR and user fees, and creating financing and funding mechanisms to MSW projects	FMEEnv	MT	Federal level
SWM in Nigeria	NESREA requires capacity building, adequate funding, and political support. The authority should have the capacity to operate as a 'Regulator'.	FMEEnv/ NESREA	ST	Federal level

Table 6.1 Summary of recommendations to improve solid waste management (SWM) in Lagos State and Nigeria (contd.)

Topic	Recommendation	Responsible institutions/ Stakeholders	Quick win/ ST/ MT/LT	Note
SWM in Nigeria	National Waste Management Council (NWMC) could be established.	FMEnv	Quick win	Federal level
SWM in Nigeria	Local Government Councils (LGCs) play a vital role in providing MSW service delivery but require clear financial and legal framework.	FMEnv	ST	Federal/state level
SWM in Nigeria	Providing up-front financial assistance to service providers through local and state authorities—simplified flow of funds for MSW projects; private sector participation through transparent, accountable contracts	FMEnv	Quick win	Funds allocated at the national level with a per person ratio (\$5 per inhabitant)
SWM in Nigeria	Plastic waste requires a national collection system—e.g., GIVO, Plastic Bank—to recover, resulting in net income around the country to both the formal and informal sectors, financed by EPR/fees on plastic production/imports.	FMEnv	Quick win	\$100 million is required to recover 2.5 kg per person
SWM in Nigeria	Unlocking market opportunities for recycled products, and accelerating waste recovery and recycling, generating jobs and wealth	FMEnv	LT	Federal level
SWM in Nigeria	Improving local capacity for fabrication/ manufacturing of waste management tools, equipment, and vehicles, including bins, vehicles, and sorters	FMEnv	MT	Federal/State level
SWM in Nigeria	Acknowledging the role of informal sector, and developing policies and regulations to improve working conditions and reduce illegal dumping	State level	MT	—
SWM in Nigeria	Household awareness campaigns	FMEnv	—	National campaigns on waste management
SWM in Nigeria	Waste sorting bins and training with wet/dry system to achieve quick results and promote both composting and source segregation	FMEnv	—	National technical guidelines on best practices for waste collection
SWM in Nigeria	Roadmap for implementation of EPR in the food and beverage sector	FMEnv/ NESREA	Quick win	—
Air pollution and GHG emissions	LAWMA to upgrade the operations at the five landfills to proper engineered operations and informal sector inclusion. Planning establishment of additional landfills in Lagos	State level	Quick win	—

Table 6.1 Summary of recommendations to improve solid waste management (SWM) in Lagos State and Nigeria (contd.)

Topic	Recommendation	Responsible institutions/ Stakeholders	Quick win/ ST/ MT/LT	Note
Air pollution and GHG emissions	LAWMA to increase engagement of the private sector participants (PSPs) to improve the rate of collection of MSW	State level	ST	—
Air pollution and GHG emissions	Organic waste segregation to support composting and divert such waste from landfilling	FMEEnv	ST	—
Air pollution and GHG emissions	The relevant regulatory institutions should enforce the laws that prohibit illegal dumping and open burning of waste in Lagos.	—	—	—
Plastic waste from healthcare facilities (HCFs)	The government should implement regulations to promote segregation and categorization of medical plastics at source. Plastics in HCFs that are not contaminated with body fluid should be separated, treated, and disposed of in a separate manner from those that are contaminated with body fluids. Only those contaminated with body fluids should be sent to the high temperature incinerators at various locations in the state if there are no means to sterilize them.	—	—	—
Plastic waste from HCFs	Deliberate efforts should be made by the government and its agencies to monitor and enforce data repository at HCFs and other points of waste generation.	—	—	—
Plastic waste from HCFs	If recycling is chosen as an option for treatment or disposal of the plastic waste from HCFs, there should be a link between the recycling organizations and the health sector to promote sourcing of recyclable materials from the HCFs.	—	—	—

Source: World Bank.

Note: EPR = extended producer responsibility, FMEEnv = Federal Ministry of Environment, GHG = greenhouse gas, GIVO = Garbage In Value Out, HCF = healthcare facilities, LAWMA = Lagos Waste Management Authority, LGC = local government council, LT = long term, MSW = municipal solid waste, MT = medium term, NESREA = National Environmental Standards Regulations and Enforcement Agency, NWMC = National Waste Management Council, PSP = private sector partnership, SWM = solid waste management, ST = short term.

6.1.1. National MSW Strategy and Governance Framework

Nigeria currently lacks a comprehensive and coherent national MSW strategy that incorporates the economic implications (costs and opportunities) of solid waste and integrates MSW as a key element of sustainable national economic growth and development. There are also no clear and measurable targets to drive and track progress on the national goal to achieve 40 percent waste diversion from landfill, 20 percent composting, and 15 percent recycling by 2030 (FmEnv 2018). This has led to inconsistent, limited, and often conflicting policies and regulations as well as underfunded and poorly integrated programs that have limited outcomes.

Over the last ten years, however, there have been commendable efforts to address some of these issues, including the Extended Producer Responsibility Guidelines (2014), *National Policy on Solid Waste Management* (NPSWM) 2018, regulatory standards for food contact recycled polyethylene terephthalate referred to as the *rPET Standards* (2019), *National Policy on Plastic Waste Management* (NPPWM) 2020, and ongoing efforts from 2020 to establish the National Circular Economy Programme (NCEP) led by the Federal Ministry of Environment (FMEEnv) (Uwaegbulam 2019). The ministry established the Nigerian Circular Economy Working Group (NCEWG) to support the NCEP objective of developing a circular economy roadmap that enumerates and describes the pathways Nigeria needs to follow to achieve circularity by 2050 (AfDB 2023). A national strategy should be developed in coordination with the states and based on a nationwide diagnostic review and needs assessment and should set achievable key performance indicators (KPIs) for the states/FCT and LGCs. Existing global tools for MSW such as the UNEP's *Guidelines for National Waste Management Strategies* as well as a detailed draft list of MSW KPIs developed for this study can be useful references for Nigeria in developing a national solid waste strategy (UNEP 2013).

Data on SWM in Nigeria are not readily available nor consolidated. This is a major challenge, as it makes planning and monitoring difficult. Therefore, Nigeria needs to establish a national MSW database to provide verified and regularly updated data and insights for informed policy making and planning. Additionally, a plastic life cycle cost assessment should be conducted to understand the impacts and costs of plastic waste pollution. Establishing a digital archive for MSW-related studies and reports can be a valuable resource for researchers, policy makers, investors, and the public.

A national strategy cannot be effective without a strong governance framework. The inadequacies of Nigeria's MSW governance framework, including the gaps in the NPSWM 2018 and NPPWM 2020, have been discussed in chapter 1. There is a need to review and improve existing legislation, policies, and regulations especially at the national and state levels to align and strengthen these instruments to support the proposed national vision and strategy for SWM. Given the country's federal structure, streamlining, and harmonizing the roles and responsibilities of national, subnational, and local agencies on MSW are essential to enhancing cooperation, coordination, oversight, and effectiveness. Additionally, merging or eliminating suboptimal and redundant agencies can minimize overlaps and reduce wastage.

A cohesive and effective MSW governance framework requires alignment and collaboration among MSW authorities and decision-makers at all levels of government. A key factor to enable this is shared ownership and access to common platforms, for example: (1) A national platform for real-time access to MSW data to inform decisions and planning; (2) National MSW KPIs that aggregate efforts by national, state, and local authorities; and (3) Nationwide extended producer responsibility (EPR) frameworks for relevant sectors to streamline compliance while guaranteeing shared benefits.

6.1.2. Accelerating the Transition to a Circular Economy Model

As noted earlier, Nigeria is laying the groundwork for a circular economy. Transiting to a circular economy and, by extension, to sustainable MSW is a gradual, but steady, process that requires awareness and active participation by individuals and organizations. The primary goal is to achieve the 3 Rs—reduce, reuse, and recycle—which can be done by implementing effective policies and regulations to incentivize circular practices by manufacturers and consumers. Regulations can oblige manufacturers to phase out nonrecyclable and hard-to-recycle plastics as well as incentivize them to reduce or ‘design-out’ waste. Waste reduction can be achieved through a variety of ways, for example, by using lighter weight containers, requiring the use of recycled materials in packaging, favoring reusable containers such as glass bottles (which have decreased substantially in the Nigerian market over time), and using biodegradable materials such as paper instead of single-use plastic (SUP) and other non-biodegradable materials.

Regulations can also incentivize the use of recycled plastics over virgin plastics in the packaging and construction industries. Disincentives can also be put in place to discourage the avoidable use of SUP packaging in Nigeria. For example, a levy on the use of SUP containers, cups, and cutlery for immediate consumption in hotels, restaurants, and cafes where they serve little to no ‘consumer convenience’ and could easily be replaced by glass, aluminum cans or other materials that have lower waste footprints. Similarly, plastic toothpicks can be disincentivized in favor of wooden toothpicks.

6.1.3. Infrastructure for Waste Management

Nigeria’s low MSW collection and recycling rates highlight the fact that related infrastructure is grossly inadequate, poorly maintained, and mostly outdated. Separate bins and compartmentalized trucks to encourage segregation at source and in transit are not available, and modern waste treatment infrastructure is scarce. The country’s first material recovery facility (MRF) was commissioned only in 2015 and remains the only one in operation; there is also only one sizeable composting plant and no clear evidence of controlled landfilling. In the case of plastic waste, the situation is slightly better given the presence of a few medium-size mechanical plastic recycling plants, including two newly established plants that will increase the country’s recycling capacity by up to 50,000 MT annually and facilitate bottle-to-bottle recycling.²³

The poor waste management infrastructure in Nigeria is a result of historical underfunding of the sector, caused by the following factors: (1) An overreliance on increasingly dwindling budgetary allocations; (2) An absence of producer responsibility schemes, which would guarantee a steady stream of funding; and (3) An inability to attract sufficient private sector investments.

The situation is exacerbated by the fact that the limited MSW infrastructure is mostly concentrated in Lagos State, the country’s economic and commercial hub, which has a higher—but still inadequate—level of MSW funding and where private sector investments have been more visible. The country’s only MRF and large composting plant, as well as most of its plastic recycling plants, are in Lagos and the neighboring Ogun state. Lagos has integrated about 450 small- and medium-

²³ IFC funded a 30,000 tons per year (TPY) continuous polymerization plant. For more information, visit the official IFC website at <https://pressroom.ifc.org/all/pages/PressDetail.aspx?ID=18605>. A second plant by Alef Recycling has a capacity of 20,000 TPY, according to industry sources. For more details, visit the official website of Alef Recycling at <https://www.alefrecycling.com/#products>.

scale enterprises as licensed waste collection agents (designated as private sector participants or PSPs) to complement the fleet of Lagos Waste Management Authority (LAWMA) on the streets. This has enabled it to achieve an estimated 63 percent collection coverage, concentrated in the Lagos metropolis (LSDP 2052).

Nevertheless, there remains a huge gap in MSW infrastructure needs in Lagos State and, more so, in other parts of the country. Investments made directly by the national government to establish 26 plastic waste recycling facilities in some states failed for many reasons, highlighting the additional challenges of poor planning and coordination with state governments (Akinwale 2018).

Several crucial measures could help resolve Nigeria's MSW infrastructure gap. These include the following: (1) Setting clear, long-term national MSW KPIs across the states and LGCs; (2) Conducting a comprehensive nationwide infrastructure gap analysis to determine the infrastructure needed in each state and LGC (including the Federal Capital Territory [FCT]) to meet these national targets; (3) Implementing a financing strategy to diversify funding sources beyond budgetary allocations; and (4) Creating action plans to improve waste segregation and sorting at source, increase collection rates for all types of waste, modernize and expand waste disposal and treatment facilities, and boost national recycling rates for all major wastes.

6.1.4 Minimizing/Controlling Pollution from Waste

The quantum of mismanaged waste in Nigeria aggravates ground and air pollution and contributes to the country's greenhouse gas (GHG) emissions from open dumpsites, poorly managed landfills, and open burning of plastic, biomass, and other wastes. It also imposes high health and economic costs on the country, estimated at nearly \$2.8 billion per year in Lagos State alone, as discussed in the topic sheet of greenhouse gas emissions in Lagos State originating from waste sector. Extrapolating these costs on a national scale would further highlight the urgent need to curb solid waste pollution in Nigeria in the following ways: (1) Reducing SUP packaging and preventing waste; (2) Increasing waste treatment capacity to minimize the volume of waste going to dumpsites, especially plastic, e-waste, and organic waste; (3) Closing or rehabilitating overstretched dumpsites and moving toward waste treatment plants and sanitary landfills; (4) Enforcing laws against open burning (including the open burning of seized narcotics and pharmaceutical drugs by relevant authorities) (Vanguard 2022); and (5) Eliminating litter to prevent flooding and marine pollution.

Marine debris and littering found on the waterways, seaside, and beaches must be cleaned, evaluating the types of plastic and other polluting materials as well as waste causing environmental degradation. Estimating the costs of cleaning help address them to companies and take the burden from taxpayers and share it with producers.

6.1.5 Market Development for Recycled Waste

An effective and long-term solution to solving the problem of solid waste pollution, particularly from plastic waste, is to create economic opportunities and local markets for waste materials. The ensuing demand for waste materials will increase the value of waste products. In Nigeria, there are a few initiatives to convert plastic waste into useful products and an array of other fields can be tapped: plastic bricks for housing construction, boards for furniture, insulation and, more recently, even food-grade PET resin for new beverage bottles and food packaging.

So far, these initiatives are limited in scale and affect relative to the volume of waste being produced and the potential market opportunities. Recycled plastic bricks and boards are stronger, more durable, and favorable in terms of cost compared to conventional cement bricks and wood or particle board, yet they are not popular in Nigeria due to low consumer awareness, low market penetration, and the perception that recycled products are of inferior quality. Similarly, demand for locally produced synthetic fibers from plastic waste is impeded by cheaper imports. The relatively recent local production of food-grade recycled PET (rPET) resins has had little to no local patronage due to the relative cost advantage of virgin PET resins and the absence of a regulatory mandate for recycled content in food and beverage packaging. This has resulted in local recyclers focusing on export markets for synthetic fibers and food-grade PET resins, while producers of recycled plastic bricks, boards, and other products operate below capacity and struggle to stay afloat.

For these and other similar initiatives to be successful, policy stimuli are necessary to create demand, evolve value chains, and build economies of scale. In this context, food-grade rPET is a notable low-hanging opportunity, given global commitments by most fast-moving consumer goods (FMCG) corporations (for example, Coca-Cola, Unilever, and Nestle) to ensure that up to 50 percent of packaging material comes from recycled content by 2030.²⁴ A regulation that mandates action on this commitment for single-use beverage and food packaging (with emphasis on locally recycled plastics) would be a game changer for the plastic waste industry in Nigeria, if implemented properly. Such a regulation could be strengthened with appropriate levies on virgin plastic to reverse its price advantage. This approach is like the EU's plastic policy, which some countries have adopted.²⁵

Similar approaches could also boost the offtake of recycled plastic bricks, boards, fibers, and other products in the building and construction sectors, supported by incentives such as reduced construction approval fees or official recognition for projects using high recycled content. Beyond the domestic market, Nigeria can leverage its advantages of market size and large feedstock to become the Economic Community of West African States (ECOWAS) or Africa regional supply point for recycled plastics for all applications. Establishment of common regional recycling standards, which the country can champion, will be key to realizing this potential.

Regulations can also incentivize cement companies to embrace or increase the use of nonrecyclable and hard-to-recycle plastic waste, along with other waste materials, as refuse derived fuel (RDF) to complement their energy sources, building on the example set by Lafarge Cement in Lagos (Ngounou 2021).

Additionally, increasing local production of organic fertilizer through composting and using it on farms could significantly reduce the amount of organic waste sent to disposal sites as well as improve soil restoration and agricultural productivity. Despite this opportunity, Nigeria's fertilizer subsidy (estimated at about ₦6 billion annually) is spent almost entirely on chemical fertilizers (This Day 2021; Gustafson 2016). The government should consider a strategic shift in the subsidy administration to prioritize local organic fertilizer production and gradually phase out chemical fertilizer subsidies in the long term. To further advance the goal of a circular economy, Nigeria should review and enhance the Public Procurement Act to promote green procurement at all levels of government.²⁶

²⁴ For more information about Coca Cola's recycling initiatives, visit the company's official website at <https://www.coca-colacompany.com/faqs/what-is-world-without-waste>. Nestle's plastic recycling efforts can be accessed at <https://www.nestle.com/sites/default/files/asset-library/documents/media/infographics/nestle-infographic-rpledge-final.pdf>.

²⁵ For information on the EU's rules on packaging and packaging waste, visit the official EU website at https://environment.ec.europa.eu/topics/waste-and-recycling/packaging-waste_en.

²⁶ The gazette notification for the Public Procurement Act is available on the website of the Bureau of Public Procurement at <https://bpp.gov.ng/wp-content/uploads/2019/01/Public-Procurement-Act-2007pdf.pdf>.

6.1.6 Sustainable Financing Model for MSW

Managing solid waste sustainably is a costly and technologically demanding process and cannot be effectively funded by overreliance on public revenue, as has been the case in Nigeria over the years and which has resulted in chronic underfunding.

In Lagos State, for example, the state government directly and indirectly accounts for 90 percent of LAWMA's funding sources while foreign and private sector investments as well as collection fees and charges together account for just about 10 percent. An assessment conducted for this study estimates that the country would need up to \$9 billion investments by 2030 to upgrade its national solid waste collection, disposal, and treatment infrastructure. However, this investment represents only an effort of \$42 per person in the next six years, thus providing jobs and economic growth.

To finance this cost, there needs to be a shift in funding strategy, moving away from relying on public revenue to creating multiple revenue streams. One such opportunity is to adopt the 'polluter-pays' principle by implementing and enforcing the EPR regulation that was introduced in 2014, which would collect funds from three targeted polluting sectors: plastic packaging, e-waste, and batteries. Another option is to implement a general plastic levy, which would be more inclusive and covers all plastic users and would generate more revenue. Additionally, a special tax on virgin packaging plastic is easier to implement, achieving price competitiveness for other materials (glass, metals, and bio-based substitutes) and promoting recycled plastics to drive offtake, as discussed earlier. A cost-reflective tariff for waste collection services can also be implemented in medium- and high-income areas while subsidized rates can apply in low-income areas.

Privatizing waste management services (collection, treatment, and recycling) in urban areas, either fully or through public-private partnerships (PPPs), can be an effective way to attract large-scale investments from both foreign and local investors, improve efficiency, and reduce the financial and logistical burden on the public treasury. This would allow the authorities to focus on effective regulation and on serving rural and peri-urban areas that may not be commercially attractive to private investors. Apart from bringing in capital, private investors can also modernize the sector with up-to-date technology, accelerate a market-based recycling economy, and provide better technical and commercial growth opportunities for small, medium, and informal waste pickers, who would necessarily be linked to their supply chains. In this way, the MSW sector can evolve into a regulated business venture, able to attract commercial financing from banks.

Other viable financing sources include maximizing philanthropic and development funding by increasing donor confidence in the viability of grants to the Nigerian waste management system, strengthening revenue collection mechanisms (for example, service fees, charges, and fines) to plug leakages, and enhancing the transparent and efficient use of funds by waste management authorities at all levels of government to deliver value for money on all expenditures. Given the large capital requirement and need for economies of scale, the shared services model should be encouraged, whereby two or more neighboring states can jointly establish a sanitary landfill or waste-to-energy plant or other regional facility to expedite the spread of scaled and viable MSW infrastructure across the country.

Table 6.2 National MSW roadmap recommendations

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
1. Effective National SWM Strategy and Governance Framework						
1.1 Develop national SWM strategies with long-term (2025–2040) collection and treatment targets for plastics and other solid wastes.	National SWM strategy documents approved	National				
1.2 Establish realistic and detailed KPIs for MSW authorities to drive and track progress on the subnational and national targets.	SWM KPIs aligned with stakeholders and implemented	National				
1.3 Update existing policy , regulatory, and legal instruments at subnational and national levels for effective implementation of the SWM strategy	a) Revised NPSWM and Operational Guidelines approved	National				
	b) Revised NPPWM and Operational Guidelines approved	National				
	c) Revised Operational Guidelines for EPR Implementation approved	National				
1.4 Streamline and harmonize the roles and responsibilities of MSW authorities at subnational and national levels to eliminate duplications, and establish a National Committee on SWM to enhance cooperation, coordination, oversight, and effectiveness	SWM Administration and Operational Frameworks developed and implemented	National				
1.5 Continuously build robust institutional capacity for effective SWM at national and subnational levels, including Local Government Councils (LGCs).	National SWM Capacity Building Framework developed and adapted at state level	National				
1.6 Establish a national SWM database hosted on a shared platform for integrated reporting and monitoring of KPIs by national and state MSW authorities.	a) National SWM database launched	National				
	b) Nationwide baseline analysis on SWM launched	National				
	c) Plastic Life Cycle Assessment Report launched	National				
2. Acceleration of the Transition to a Circular Economy Model						
2.1 Develop and implement appropriate policy frameworks to enable the circular economy transition and promote waste reduction, reuse, and recycling.	Nigerian Circular Economy Roadmap launched and adapted at state level	National				

Table 6.2 National MSW roadmap recommendations (contd.)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
2.2 Promote responsible waste management culture at personal, home, and institutional levels to drive sustainable waste management practices.	National Waste Management Awareness and Advocacy Campaign implemented	National				
2.3 Reduce plastic consumption, particularly single-use plastics (SUP), and promote reusable and non-plastic alternatives, e.g., returnable glass bottles.	a) Nonrecyclable plastics phased out for packaging and household products	National				
	b) Tax imposed on virgin plastics for all applications					
	c) Additional levy imposed on SUP food/ beverage packs and cutlery in hotels/ restaurants	National				
	d) Additional charge imposed on plastic shopping bags at point of sale	National				
2.4 Create domestic market opportunities for recycled plastics and organic fertilizers, including development of relevant industrial standards for recycling and composting.	a) Regulation on mandatory recycled content for SUP packaging implemented.	National				
	b) Guidelines and incentives for recycled content in building/construction industry implemented	National				
	c) National masterplan on organic fertilizer development implemented	National				
	d) Public Procurement Act updated to prioritize green procurement	National				
	e) Common regional standards for recycled plastics adopted to enable recycling at scale	National				
2.5 Boost local innovation and commercialization of products from recycled plastic/other wastes and bio-based substitutes for plastics as well as machineries and tools for SWM.	National Solid Waste Sector Innovation Fund and implementation guidelines launched	National				

Table 6.2 National MSW roadmap recommendations (contd.)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
3. Expansion of MSW Collection and Treatment Infrastructure						
3.1 Conduct a comprehensive nationwide SWM infrastructure gap analysis to determine needs and funding requirement.	SWM infrastructure adequacy plan approved	National				
3.2 Improve sorting/segregation rates by providing facilities and incentives for at-source separation of waste at households and other waste generation points.	a) Ratio of households with segregated wastebins improved	States/FCT	_%	_%	_%	_%
	b) Compartmentalized trucks standardized for waste collection	States/FCT				
	c) Waste sorting/segregation rate improved progressively	States/FCT	_%	_%	_%	_%
3.3 Strengthen the capacity of the informal sector and SME players to enhance their effectiveness and growth.	Financial and operational capacity development plan for informal sector implemented	States/FCT				
3.4 Provide adequate fleet of suitable waste collection vehicles (including for underserved communities) to ensure regular and effective evacuation of waste.	a) Coverage of MSW services (formal collection rate) improved	States/FCT	_%	_%	_%	_%
	b) Plastic waste collection rate improved	States/FCT	_%	_%	_%	_%
3.5 Incentivize private sector investments in material recovery facilities (MRFs), including composting plants for organic fertilizer production.	a) At least one medium or large-scale MRF plant established in each state	National/ States/FCT	_#	_#	_#	_#
	b) Ratio of composted organic waste improved	States/FCT	_%	_%	_%	_%
3.6 Incentivize private sector investments in mechanical and chemical plastic recycling plants .	Plastic recycling rate improved	National/ States/FCT	_%	_%	_%	_%
3.7 Incentivize refuse derived fuels (RDF) to boost offtake of nonrecyclable and hard-to-recycle plastic and other waste materials.	Number of factories adopting RDF increased	National/ States/FCT	_#	_#	_#	_#
3.8 Incentivize investment in engineered/sanitary landfills to minimize the volume of residual waste in open dumpsites.	Engineered/sanitary landfills established in key cities	National/ States/FCT	_#	_#	_#	_#
3.9 Incentivize investments in specialized facilities for separation, collection, and treatment/disposal of medical and other hazardous solid wastes .	Specialized waste facilities established in key cities for medical/other hazardous solid waste	National/ States/FCT	_#	_#	_#	_#

Table 6.2 National MSW roadmap recommendations (contd.)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
4. Improvement of Pollution Management and Control						
4.1 Minimize the volume of mismanaged solid waste through improved MSW collection, treatment, and disposal.	a) Ratio of mismanaged MSW reduced	States/FCT	_%	_%	_%	_%
	b) Ratio of mismanaged plastic waste reduced	States/FCT	_%	_%	_%	_%
4.2 Eliminate open burning of waste (including by municipal authorities and other agencies) through enforcing relevant laws and regulations.	a) Ratio of burned MSW reduced	States/FCT	_%	_%	_%	_%
	b) Ratio of burned plastic waste reduced	States/FCT	_%	_%	_%	_%
4.3 Eradicate drainage and marine litter by plastic and other solid waste.	a) Ratio of MSW litter in marine body reduced	States/FCT	_%	_%	_%	_%
	b) Ratio of plastic waste litter in marine body reduced	States/FCT	_%	_%	_%	_%
4.4 Reduce GHG emissions from mismanaged solid waste.	GHG emissions reduced	States/FCT	_#	_#	_#	_#
5. Establishment of Sustainable Financing Framework for SWM						
5.1 Optimize private sector investments and financing to reduce the current overreliance on public revenue	a) Credible PPP framework for the SWM sector implemented, attracting incremental investment	National/ States/ FCT	\$_	\$_	\$_	\$_
	b) Mandatory EPR scheme implemented nationwide for major waste streams	National/ States/ FCT	\$_	\$_	\$_	\$_
5.2 Leverage other finance channels to augment funding for SWM	a) Cost-reflective tariffs implemented in appropriate districts for MSW collection services	States/FCT				
	b) Virgin plastics tax fund wholly dedicated to plastic waste management	National/ States/ FCT				
	c) Development and donor funding opportunities optimized	National/ States/ FCT	\$_	\$_	\$_	\$_

Source: World Bank.

Note: EPR = Extended producer responsibility, FCT = Federal Capital Territory, FMEEnv = Federal Ministry of Environment, GHG = greenhouse gas, KPI = key performance indicator, LGC = Local Government Councils, MSW = municipal solid waste, NPPWM = National Policy on Plastic Waste Management, NPSWM = National Policy on Solid Waste Management, SUP = single-use plastic, SWM = solid waste management.

6.2 RECOMMENDATIONS FOR LAGOS STATE

For various reasons highlighted earlier in this report, such as better SWM infrastructure and access to funding (compared to the other states in Nigeria), Lagos State is in a position to expedite its SWM sector development and circular economy transition, in keeping with the urgent tone of its long-term development plan. This report, therefore, provides a separate SWM Roadmap for Lagos State (table 6.4). Lagos State can and should accelerate its own pace especially in the operational areas of SWM such as expanding its waste collection, treatment, and disposal capacities. Leveraging its several advantages, the state can support federal authorities in accelerating the development of nationally applicable policy and regulatory tools, such as an EPR scheme or major tax incentives, which may not be legitimately or profitably implemented by a state acting alone.

6.2.1 The Lagos State Long-Term Development Plan for SWM

In 2022, the Lagos State Government launched a comprehensive 30-year *Lagos State Development Plan 2052* (LSDP 2052) which envisions Lagos becoming Africa’s model megacity and a globally competitive economic and financial hub. The action plan for this vision includes developing “best-in-class waste management system to consistently position Lagos State among the top 3 cleanest cities in Africa.” This is quite an ambitious goal given that although Lagos has been a trailblazer in MSW management nationally, it lags behind peer African cities such as Johannesburg, Cairo, and Nairobi and is not ranked currently among the continent’s 10 cleanest cities (Nigeria MoEPB 2022). The LSDP 2052 also identifies near- and long-term goals as well as outcomes for the MSW sector by 2052, summarized in table 6.3.

Table 6.3 Summary goals and outcomes for MSW in Lagos State as per LSDP 2052

Next 5 Years (2022–27)	Beyond Next 5 Years (2028–52)	Target MSW Outcomes (2052)
• Implement waste separation at source and promote alternative uses for organics • Community waste strategies for underserved communities • Monitor, evaluate, and update PSP waste collection contracts • Scale up biodigester use for households and communities	• Frame waste infrastructure development strategy • Construct sanitary landfills with landfill gas capture at existing and new sites • Install industrial effluent treatment plants for 50% of businesses	• 95% of total waste collected (baseline: 63%) • 45% waste recycling capacity (baseline: 10%) • 50% of organic waste composted • Open dumping and burning reduced to 50% • 20% of landfill gas captured

Source: Lagos State Development Plan 2052 (LSDP 2052).

Note: MSW = municipal solid waste.

The LSDP further identifies 17 key initiatives across four thematic areas to improve MSW and enable the state to achieve the vision of becoming one of the top three cleanest cities in Africa (Nigeria MoEPB 2022). An important indicator of the Lagos State Government’s commitment to the LSDP is the development of Medium-Term Sector Strategies (MTSS) which link the LSDP’s long-term goals with a set of costed and prioritized programs that fit the resource constraints. The MTSS for the MSW sector outlines several institutional, human, and infrastructural capacity development programs and projects.

Table 6.4 MSW roadmap recommendations for Lagos State

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
1. Lagos State SWM Strategy and Governance Framework						
1.1 Develop and implement a comprehensive MSW strategy for Lagos State to achieve the MSW vision and targets defined in the Lagos State Development Plan 2052.	a) A diagnostic review of SWM (including infrastructure analysis) in Lagos State completed (currently WIP)	State				
	b) Statewide baseline analysis on plastic and other solid waste completed and integrated into the national database	State				
	c) Realistic SWM KPIs, linked to the national targets, developed	National/State				
	d) Lagos State MSW Strategy aligned to the LSDP SWM Plan launched	State				
1.2 Update existing state policy, regulatory, and legal instruments for effective implementation of the SWM strategy	a) Lagos State Plastic Management Policy revised to align with NPPWM and LSDP 2052, operational guidelines developed and implemented	State				
	b) Lagos State laws and regulations on all categories of solid waste updated and enforced	State				
1.3 Continuously build robust institutional capacity (knowledge/tools/funding) for effective SWM at State and Local Government Council (LGC) levels.	a) LAWMA reorganized or restructured based on the Lagos SWM diagnosis and benchmarking of counterparts in select peer cities	State				
	b) Responsibility for SWM outside of the Lagos Metropolitan Area devolved to LGCs	State				
	c) Per person budgetary allocations for SWM improved incrementally	State		\$5	\$7	\$10
	d) Full SWM cost recovery achieved through tariffs, levies (including EPR), and relative taxes	State	50%	100%	100%	100%

Table 6.4 MSW roadmap recommendations for Lagos State (contd.)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
2. Acceleration of the Transition to a Circular Economy Model						
2.1 Support the federal government in the development and implementation of the Nigerian Circular Economy Roadmap and related recommendations in this report to boost the effectiveness of the Circular Lagos Initiative.	Circular Lagos Initiative strengthened and aligned to the National Circular Economy Roadmap	National/State				
2.2 Promote responsible waste management culture at personal, home, and institutional levels to drive sustainable waste management practices.	Waste Management Awareness and Advocacy Campaign implemented	National/State				
2.3 Enforce national policies and regulations on reduction of plastic consumption, particularly single-use plastics , and promote reusable and nonplastic alternatives, e.g., returnable glass bottles.	a) Non-recyclable plastics phased out for packaging and household products	National				
	b) Tax imposed on virgin plastics for all applications	National				
	c) Additional levy imposed on SUP food/ beverage packs and cutlery in hotels/ restaurants	National/State				
	d) Additional charge imposed on plastic shopping bags at point of sale	National/State				
2.4 Boost market opportunities for recycled plastics and organic fertilizers.	a) Regulation on mandatory recycled content for SUP packaging implemented	National				
	b) Guidelines and incentives for recycled content in building/construction industry implemented	National/State				
	c) National masterplan on organic fertilizer development implemented in Lagos State	National/State				
	d) Lagos State Public Procurement Law updated to prioritize green procurement	State				
2.5 Boost local innovation and commercialization of products from recycled plastic/other wastes and bio-based substitutes for plastics as well as machineries and tools for SWM.	National Solid Waste Sector Innovation Fund and implementation guidelines implemented in Lagos State	National/State				

Table 6.4 MSW roadmap recommendations for Lagos State (*contd.*)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
3. Expansion of MSW Collection and Treatment Infrastructure						
3.1 Establish enabling environment for large-scale private sector investments to expand and modernize waste collection, treatment, and disposal services to deliver the 2052 target outcomes.	Increased large-scale private investments in SWM in Lagos State	State				
3.2 Strengthen the capacity of the informal sector and SME players to enhance their effectiveness and growth.	Technical and financial support systems for informal sector and PSPs implemented	State				
3.3 Deploy and enforce the use of two-way (wet and dry) segregated wastebins rates for at-source separation of waste at households and other waste generation points.	a) Ratio of households with segregated wastebins improved	State	_%	_%	_%	_%
	b) Compartmentalized trucks standardized for waste collection	State				
	c) Waste sorting/segregation rate improved progressively	State	_%	_%	_%	_%
3.4 Incentivize investment in adequate fleet of suitable waste collection vehicles (including for hard-to-reach areas) to ensure regular and effective evacuation of waste.	a) Coverage of MSW services (collection rate) improved	State	_%	_%	_%	_%
3.5 Incentivize investment in additional transfer loading stations incorporating mini material recovery facilities (MRFs) in phases across the state in line with the LSDP 2052.	Thirty new transfer loading stations commissioned in phases	State				
3.6 Incentivize investment in large-scale material recovery facilities (MRFs) with organic fertilizer plants through private sector collaboration.	a) Three new large-scale MRF plants established in Lagos State	State				
	b) Ratio of composted organic waste improved	State	_%	_%	_%	_%
3.7 Incentivize investment in adequate mechanical/chemical plastic recycling and upcycling capacities to transform Lagos into a national and regional plastic recycling hub .	a) Plastic waste collection rate improved	State	_%	_%	_%	_%
	b) Plastic waste recycling rate improved	State	_%	_%	_%	_%
3.8 Incentivize investment in refuse derived fuels (RDF) by factories to boost offtake of nonrecyclable and hard-to-recycle plastic and other waste materials.	Number of factories adopting RDF increased	State	_#	_#	_#	_#

Table 6.4 MSW roadmap recommendations for Lagos State (contd.)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
3.9 Incentivize investment in engineered/sanitary landfills to minimize the volume of residual waste in open dumpsites.	One engineered/sanitary landfills established in Lagos State	State				
3.10 Incentivize investments in specialized facilities for separation, collection, and treatment/disposal of medical and other hazardous solid wastes .	Adequate facilities established in Lagos State for medical/other hazardous solid waste	State				
4. Improvement of Pollution Management and Control						
4.1 Minimize the volume of mismanaged solid waste through improved MSW collection, treatment, and disposal.	a) Ratio of mismanaged MSW reduced	State	_%	_%	_%	_%
	b) Ratio of mismanaged plastic waste reduced	State	_%	_%	_%	_%
4.2 Eliminate open burning of waste (including by municipal authorities and other agencies) through enforcing relevant laws and regulations.	a) Ratio of burned MSW reduced	State	_%	_%	_%	_%
	b) Ratio of burned plastic waste reduced	State	_%	_%	_%	_%
4.3 Install barriers at major inlets to trap plastic and other solid waste and eradicate marine litter .	a) Ratio of MSW litter in marine body reduced	State	_%	_%	_%	_%
	b) Ratio of plastic waste litter in marine body reduced	State	_%	_%	_%	_%
4.4 Reduce GHG emissions from mismanaged solid waste through effective management of dumpsites and proper decommissioning of filled sites.	a) Biogas plant established at each major dumpsite	State	_#	_#	_#	_#
	b) GHG emissions reduced	State	_#	_#	_#	_#
5. Establishment of Sustainable Financing Framework for SWM						
5.1 Optimize private sector investments and financing to reduce the current overreliance on public revenue	a) Credible PPP framework for the SWM sector implemented, attracting incremental investment	State/National	\$_	\$_	\$_	\$_
	b) Mandatory EPR scheme implemented for major waste streams	National	\$_	\$_	\$_	\$_

Table 6.4 MSW roadmap recommendations for Lagos State (contd.)

Goals	Deliverables/Metrics	Responsibility (State/ National)	Timeframe			
			Quick win	Short Term	Medium Term	Long Term
			2025	2027	2030	2040
5.2 Leverage other finance channels to augment funding for SWM	a) Cost-reflective tariffs implemented in appropriate districts for MSW collection services	State				
	b) Long-term funding accessed from green bonds	State				
	c) Virgin plastics tax fund wholly dedicated to plastic waste management	National/State				
	d) Development and donor funding opportunities optimized	State/National	\$ _	\$ _	\$ _	\$ _
	e) Per person budgetary allocations for SWM improved	State/National		\$5	\$7	\$10

Source: World Bank.

Note: EPR = extended producer responsibility, GHG = greenhouse gas, KPI = key performance indicator, LAMATA = Lagos Metropolitan Area, LAWMA = Lagos Waste Management Authority, LSDP = Lagos State Development Plan 2052, LGA = local government area, LGC = local government councils, NPPWM = National Policy on Plastic Waste Management, MSW = municipal solid waste, PPP = public-private partnership, PSP = private sector partnership, RDF = refuse derived fuel, SME = small and medium enterprise, SUP = single-use plastic, SWM = solid waste management.

Finally, developing Nigeria's MSW sector will require effective cooperation and collaboration between federal and state governments and other sectors and among the states to articulate a coherent national strategy and policy framework, as well as promote a shared infrastructure model, as discussed earlier in this report. Several efforts are already underway by the World Bank to tackle the problem of plastics pollution in coastal West Africa (box 6.1). Lagos State, which is usually seen as a pacesetter on MSW management in the Nigerian context, can play a particularly important role in this regard through the following ways: (1) Provide technical assistance to some other states that may desire to replicate its successful MSW initiatives; (2) Provide active support for key national-level MSW policies, regulations, tools, and initiatives which will be crucial for facilitating the pace and buy-in by other states; and (3) Pilot some of the recommended MSW initiatives such as two-way waste segregation and disincentivizing of SUP packaging in hotels, restaurants, and catering businesses to provide useful learning and implementation templates for the other states.

BOX 6.1 WORLD BANK'S WACA PROGRAM ON PLASTICS POLLUTION IN WEST AFRICA

The World Bank's West Africa Coastal Areas Management Program (WACA) has embarked on a multipronged strategy to address the growing issue of plastic pollution in coastal West Africa. A series of reports provide insight into the impacts of plastics on marine pollution. The program's approach emphasizes the importance of engaging partners from various sectors to coordinate actions at regional, national, and local levels, ensuring that stakeholders are actively involved in finding solutions.

The studies discussed in the reports highlight the significant increase in plastic consumption in coastal West Africa, driven by rapid urbanization and economic growth. The region's urban population doubled between 2000 and 2015, leading to a surge in the use of plastics, particularly in the food and water packaging industries. Despite limited local production, most plastic used in the region is imported, with Nigeria, Ghana, and Côte d'Ivoire being the primary producers and exporters. However, mismanagement of plastic waste in 14 out of 17 coastal countries poses a severe threat, with over 80 percent of plastic ending up improperly disposed of, increasing the risk of pollution in the oceans.

The environmental costs of marine plastics in West Africa are substantial, estimated to range from \$10,000 to \$33,000 per ton of plastic waste. To address this issue, improvements are urgently needed in solid waste management, particularly in plastic waste management and recycling infrastructure. A circular economy model shows promise in reducing plastic waste by 40 to 50 percent, but policy support is crucial to make recycled plastics more economically viable. Public awareness, stakeholder participation, and access to environmentally friendly alternatives are essential components of an effective waste management strategy in the region.

Note: For more information on the World Bank's WACA Program, visit the official website: <https://www.wacaprogram.org/plastics>.

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CHAPTER 7

CONCLUSIONS



The previous chapters of this report discussed the status, challenges, and opportunities of solid waste management (SWM) in Nigeria with particular focus on plastic waste and Lagos State, highlighting some salient issues. It was established that despite noticeable efforts by governments at various levels, the country's aggregate waste management capacity (financing, institutional, infrastructural, and so on) is significantly inadequate relative to the rapid growth and evolving complexity of solid waste generation. This has led to low rates of segregation (18 percent in Lagos), formal collection coverage (below 20 percent), and recycling and composting (each below 13 percent), compared to peer countries such as Brazil, India, and South Africa. The resulting high rate of inadequately managed waste has made Nigeria a leading country globally on air and marine pollutions. This capacity challenge and its underlying factors and impact cut across the country's 36 federating states, with Lagos State making more progress toward modernizing its municipal solid waste (MSW) management systems but lags behind peer African cities such as Nairobi, Johannesburg, and Cairo.

Although Nigeria has taken progressive steps to develop national-level policies for the management of solid waste and plastic waste, these policies have been ineffective due to absence of implementation guidelines and regulations to facilitate enforcement. Added to this is the absence of an integrated national SWM strategy with detailed key performance indicators (KPIs) to track progress toward the policy goals. The paucity of data on every aspect of MSW management impedes effective understanding and management of the solid waste sector, thus undermining these policies.

Some inherent contradictions in Nigeria's SWM system entrench ineffectiveness and pollution as well as undermine waste recovery and value creation. For example, despite a glaring inability to finance and manage MSW infrastructure, state governments persist in grappling with this task rather than create credible policy environments and incentives to attract large-scale private investors. With over 80 percent of solid waste inadequately managed (over 35 million metric tons [MT] annually), no sanitary landfill, and just one medium-scale composting plant, the country is in dire need of some large-scale waste operators with capacity to fund and manage modern waste recovery and treatment plants, to complement efforts by municipal waste management authorities and the formal and informal sector operators such as the private sector partnerships (PSPs) in Lagos. Another contradiction is the government itself flouting the laws against waste burning with agencies such as National Agency for Food and Drug Administration and Control (NAFDAC) and National Drug Law Enforcement Agency (NDLEA) openly burning expired or seized pharmaceutical and narcotic drugs habitually—and the national environment regulator NESREA unable to halt this practice that undermines efforts at curbing air pollution.

Despite the above challenges, the Nigerian SWM sector, especially the plastic waste subsector, seems vibrant and full of potential. At the government level, there is a keen awareness of the challenges, and early steps are being taken toward a circular economy, including recycled polyethylene terephthalate (rPET) standards approved in 2019 and extended producer responsibility (EPR) regulations in progress. The ecosystem is evolving—waste entrepreneurs expanding the collection system and incentivizing recovery of recyclables; a few technology start-ups innovating and piloting data aggregation and payment platforms; small and medium enterprises (SMEs) repurposing plastic waste to make bricks, board, roofing sheets, and so on; and mechanical plastic recycling expanding with food contact rPET capability. A missing crucial link has been the lack of deliberate measures to create a domestic market for recycled products and unlock growth in the

value chain through regulations such as mandatory rPET content for polyethylene terephthalate (PET) bottles and green procurement by government agencies.

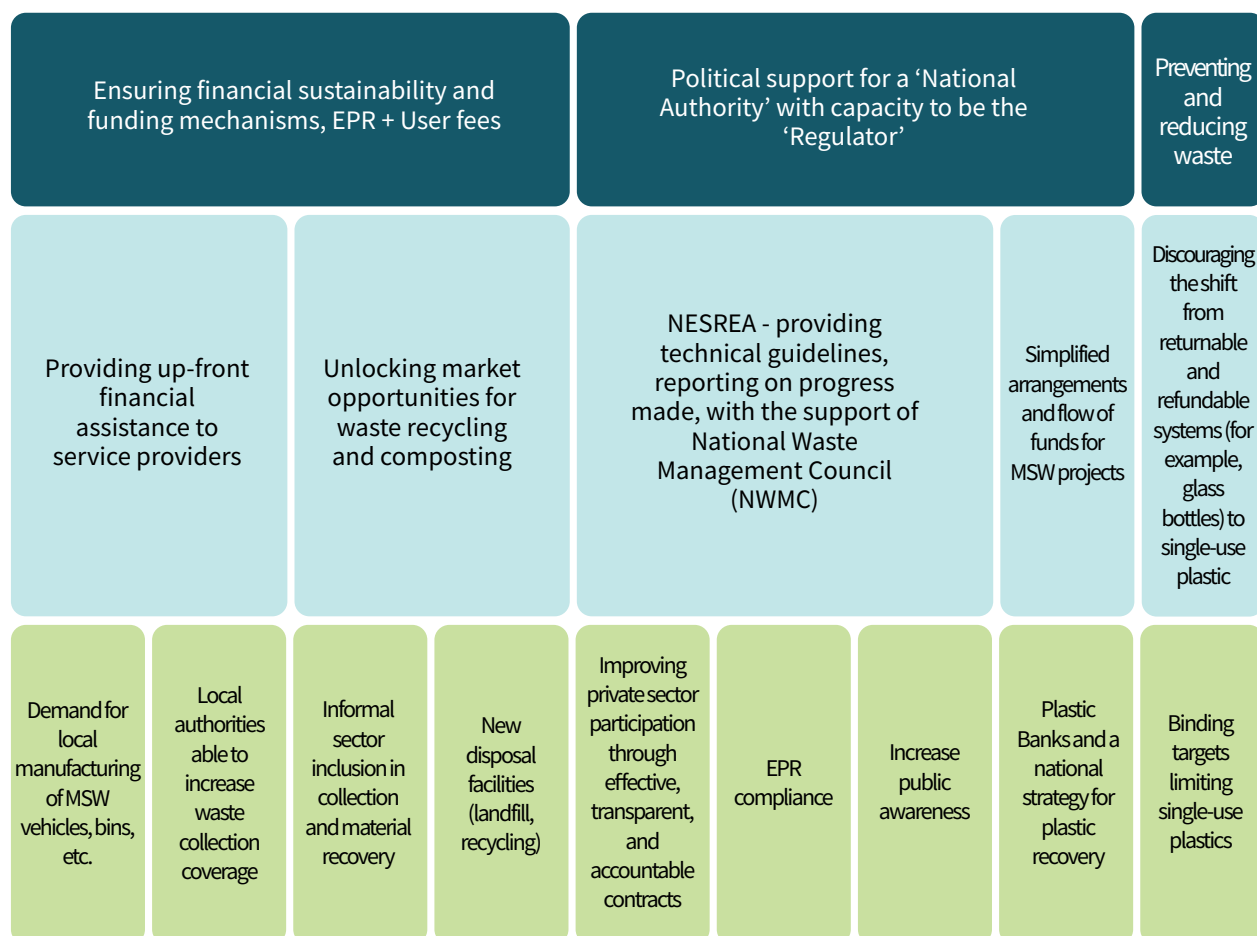
Against this background, Nigeria needs to rethink its SWM approach, considering the following imperatives which were discussed earlier in this report and outlined in the roadmap recommendations:

- **Conducting a systemic review and updating current waste management systems with a focus on fulfilling the basic needs for data availability, integrated planning, sustainable financing, infrastructure adequacy, institutional capacity, and effective collaboration among the three tiers of government.**
- **Shifting the financing of MSW from the government to a more sustainable model anchored on private sector financing, EPR, and cost-reflective waste collection fees.** Responding appropriately to ensure policy consistency and strengthen investor confidence in the operating environment are crucial to achieving this objective.
- **Accelerating ongoing programs to develop and implement a circular economy transition framework, which aligns with local realities and is supported with relevant regulatory and other tools for market and value chains development to promote waste reduction, reuse, and recycling.**
- **Entrenching accountability in the waste management system through developing and monitoring clear targets and KPIs for local, state, and national level authorities and operators as well as transparently enforcing rules and regulations on all actors in the system.**
- **Investing in behavior change programs across all segments of society is crucial to inculcate positive waste handling and disposal habits.** This is not a short-term fix, as sometimes results are hard to see immediately; hence, interventions need to be continued.

With Nigeria's status as Africa's leading economy, its large population, and huge waste volumes which represent valuable feedstocks for various waste recycling applications, the waste pollution challenge can be transformed into socioeconomic opportunities to boost entrepreneurship, job creation, innovation, and industrialization, if the country has the political will to implement the necessary reforms for a circular-economy-oriented waste management system. In this regard, Nigeria can become a circular economy model for Africa, convening the region and catalyzing collaborative actions to advance a circular Africa.

Figure 7.1 provides a summary of challenges, gaps, and opportunities on plastics waste management in Lagos State.

Figure 7.1 Summary of challenges, gaps, and opportunities on plastics waste management in Lagos State



Source: World Bank.

Note: EPR = extended producer responsibility, MSW = municipal solid waste, NESREA = National Environmental Standards Regulations and Enforcement Agency, NWMC = National Waste Management Council.



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TOPIC SHEET 1

SOLID WASTE GENERATION AND MANAGEMENT IN NIGERIA

Further information on this topic is available at:
*Improving Solid Waste and Plastics Management in Lagos State: An
Analysis of the Solid Waste Sector* (Internal report).

Nigeria, with a population of over 218 million (2022), is the seventh-most populated country in the world and the most populous country in Africa. Lagos, its economic hub and former capital, is the most populous city in Africa, as well as the largest coastal city on the continent, with estimated 24 million residents (Lagos Bureau of Statistics 2016). Urbanization is rampant in Nigeria, estimated at 54 percent and growing at a rate of 3.8 percent annually. The country's economy is also the largest in Africa in terms of GDP, estimated at \$477.39 billion in current US dollars in 2022.²⁷ Rapid economic development is expected in the coming decade, along with a growing middle class and increased consumption of goods and services.

In Nigeria, as in other developing countries, municipal solid waste (MSW) generation is driven by factors such as population growth, urbanization, and economic progress and is compounded by shifting consumption and production patterns as well as a rise in imports, tourism, industrialization, and the global waste trade. By 2040, it is anticipated that MSW generation in Nigeria will double from 2021 levels, with increased complexity of the waste produced. Since adequate investment and systems to manage this waste efficiently have not been put in place, existing infrastructure will be put under further strain, exacerbating the prevailing poor practices such as insufficient collection, open dumping, and indiscriminate burning. If urgent upgrades are not made to the current waste management capacity and systems, the projected increase in solid waste generation is likely to worsen the public health crisis and environmental degradation. Section TS1.2 highlights the institutional framework of this sector, while section TS1.3 offers a look at the policy scenario of the MSW sector at the national level.

TS1.1 MSW MANAGEMENT LANDSCAPE IN NIGERIA

Section TS1.1.1 describes the current landscape of MSW in Nigeria, encompassing waste generation, composition, collection, transport and transfer, processing and treatment, and eventual disposal. Section TS1.1.2 provides a summary of the challenges in improving the MSW value chain in Nigeria, while section TS1.1.3 summarizes recommendations to improve the overall MSW system.

TS1.1.1 Current Status

The solid waste management (SWM) value chain refers to the interconnected activities involved in managing waste from generation to final disposal. Nigeria's MSW management practices vary by region, but generally follow the patterns observed in other middle-income countries regarding waste generation, collection, transportation, treatment, and disposal.

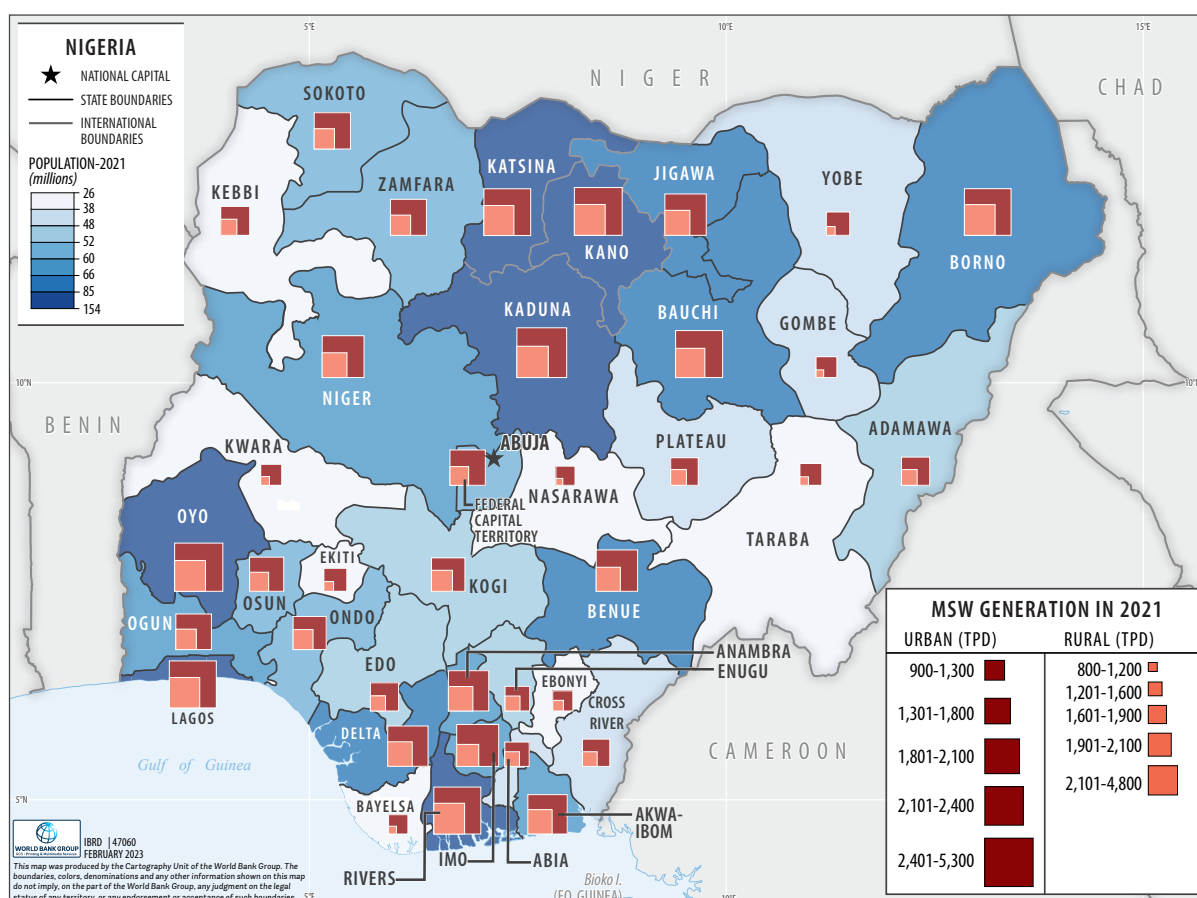
The existing SWM system in Nigeria has been largely rudimentary and lacking efficiency but is fast evolving with significant room for improvement. The SWM process is predominantly linear, following a 'take-make-dispose' approach rather than a circular process.

²⁷ This information is taken from the database of the Nigeria Country-level Data website of the World Bank, Washington, DC (accessed September 4, 2023), <https://data.worldbank.org/country/nigeria>.

TS1.1.1.1 Municipal Solid Waste Generation

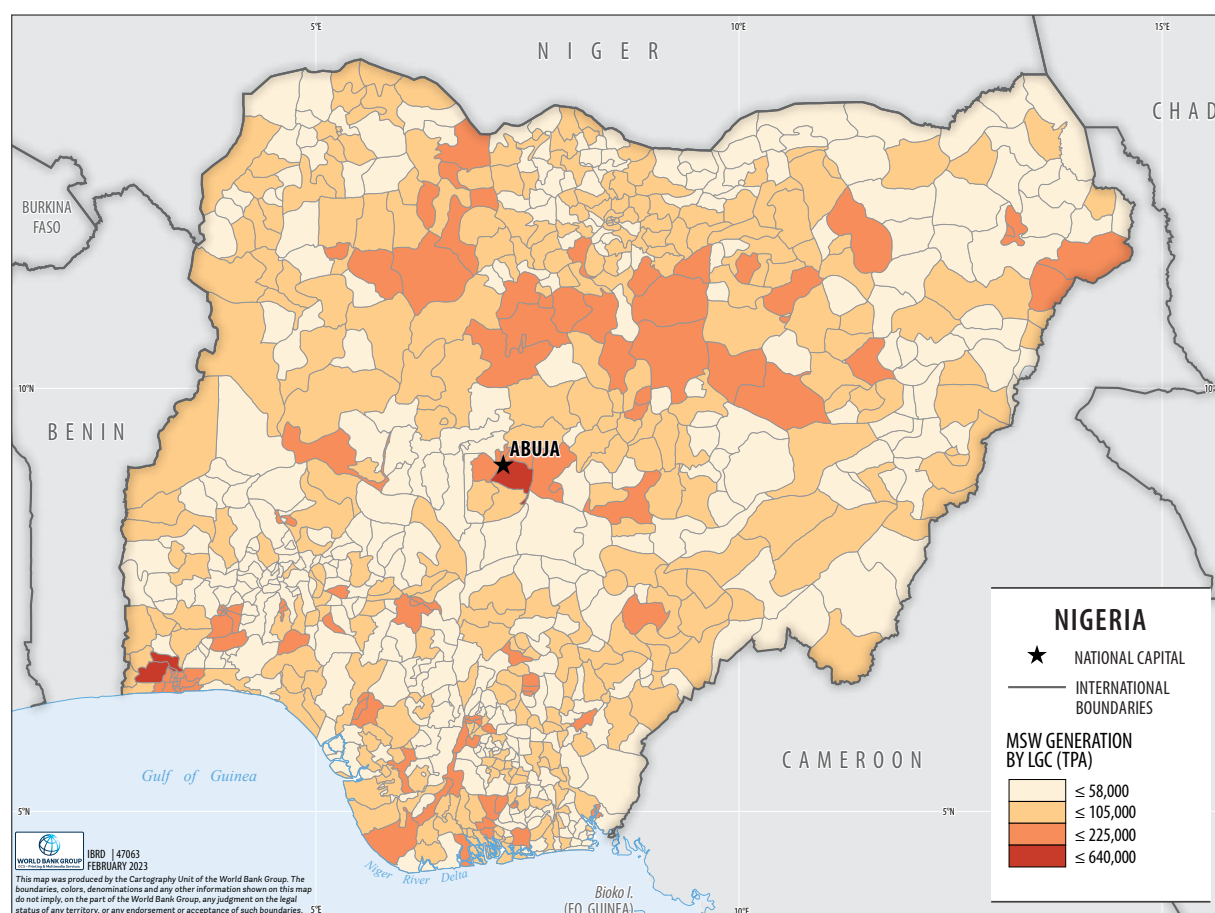
Nigeria ranks as one of the top three solid waste producing countries in Africa. MSW has steadily increased in Nigeria from 25 million metric tons (MT) in 2009 to 44.5 million MT of MSW in 2021. As in other countries, urban areas in Nigeria generate more solid waste than rural areas. Daily waste generation varies from 0.44 kg per person in rural areas to 0.66 kg per person in urban areas, with an average of 0.58 kg per person across the country. Among the states, the highest volumes of solid waste are produced in Lagos, Kano, and Kaduna, while the lowest amounts are generated in Nasarawa and Bayelsa. MSW generation values by state and local government councils (LGCs) are illustrated in maps TS1.1 and TS1.2, respectively.

Map TS1.1 Waste generation by state in Nigeria, 2021



Note: TPD = tons per day.

Map TS1.2 Waste generation by local government councils in Nigeria



Note: LGA = local government area.

By 2040, it is expected that the quantity of MSW generated in Nigeria will almost double, reaching 89.8 million MT.²⁸ This means that the growth of the sector, and the funding required to manage it, will also grow exponentially. The rate of growth of MSW generation is dependent on factors other than only population growth, such as urbanization, changing lifestyles and consumption patterns, and economic growth. As more people move to cities and their lifestyle and consumption patterns change, they tend to generate more waste. As economies grow, there is a corresponding increase in waste generation, as people consume more goods and services (World Bank 2024d, internal report).

TS1.1.1.2 Municipal Solid Waste Composition

The composition and types of MSW generated in Nigeria are heterogeneous and influenced by socioeconomic structure, culture, location, population density, and consumption patterns. Although there are no national-level data available on MSW composition, studies in major cities in Nigeria suggest an average of the types of waste generated, as shown in table TS1.1.

²⁸ This estimate is based on a per person waste generation rate of 0.4 kg per person per day in rural areas and 0.66 kg per person per day in urban areas as well as using 59.2 percent and 64.9 percent urbanization rate for 2030 and 2040, respectively.

Table TS1.1 Solid waste composition in Nigeria

Organic	49.78
Paper	12.79
Plastic	8.4
Glass	3.75
Metal	5.48
Textile and leather	3.01
Inert and others	15.03

Source: Harir, Kasim, and Ishiyaku 2015.

Note: Calculated based on MSW composition across major cities in Nigeria. Amount does not add up to 100 percent due to rounding off errors.

Organic material, comprising food and green waste, makes up the largest portion of solid waste, averaging 49.78 percent and also represents the compostable fraction. The recyclable fraction, comprising paper, plastics, metals, and glass, makes up 30.42 percent of overall MSW. The importance of organic waste in Nigeria is described in box TS1.1.

BOX TS1.1 MANAGING ORGANIC MSW IN NIGERIA

Composting organic waste has numerous benefits, including reducing the amount sent to already overflowing dumpsites/landfills and creating a cost-effective soil amendment that boosts agricultural productivity, reduces water usage, and eliminates the need for chemical fertilizers. The large population of farmers in Nigeria, who make up nearly 90 percent of rural livelihoods, provides a significant market for compost. Importantly, it also prevents the generation of methane, a potent greenhouse gas (GHG), from the decomposition of organic waste in dumpsites and landfills as well as the creation of leachate.

In 2023, synthetic fertilizers are sold for \$0.36 per kg. In contrast, compost produced in Lagos is sold for \$0.26 per kg. Based on the 2.23 million MT of compost that can be produced from 11.1 million MT organic waste (considering a 50 percent capture rate), this could generate a potential income of \$587 million per year.

To effectively promote composting, there must be a comprehensive policy framework that includes source separation, organic waste collection logistics, landfill diversion measures, and compost quality. Transparent manufacturing, marketing, and labelling will boost product competitiveness in local markets.

In large cities, such as Lagos, decentralized composting at the ward level can be more effective than large, centralized, and highly mechanized facilities. It reduces transportation costs, uses low-cost technologies and manual labor, and ensures proper waste sorting through community engagement. However, small-scale decentralized composting may not be feasible (due to space constraints in densely populated areas) and large-scale facilities are difficult to finance, operate, and maintain. A combination of small- and large-scale solutions is needed to distribute costs and activities. This will require an enabling governance environment, institutional capacity, financial provisions, infrastructure, and monitoring and control mechanisms.

Note: For more information on agriculture in Nigeria, visit the website of Statista at <https://www.statista.com/topics/6729/agriculture-in-nigeria/#dossier-chapter6>.

TS1.1.1.3 Municipal Solid Waste Collection

Less than 20 percent (equivalent to 8.9 million MT) of the 44.5 million MT of MSW generated annually are formally collected. Limited waste collection and disposal services are available mostly in cities in Nigeria. In rural areas, composting of organic waste is common due to the agrarian economy, while other wastes are mostly dumped or burned.

Primary waste collection in low-income areas is mainly performed by individuals or nongovernmental organizations (NGOs) and small private enterprises, who charge fees to do so. The informal sector plays an important role in collecting waste, as described in box TS1.2. These organizations typically utilize simple equipment such as pushcarts, which restricts the amount of waste that can be transported to the final disposal site. There is also a lack of standardization of the types and volumes of waste containers, including bins, buckets, and drums.

In some areas, due to insufficient secondary waste collection, MSW is disposed of in open lots or drainage channels. Often, user fees only cover primary collection, exacerbating the financial deficits of the waste management system. Where secondary collection is available, waste is usually taken to designated dumpsites, even if some of these are inadequately managed or not managed at all.

BOX TS1.2 ROLE OF THE INFORMAL SECTOR IN MSW MANAGEMENT IN NIGERIA

The informal sector collects and disposes of about 60 percent of the wastes generated in Nigeria, underscoring the critical role played by this sector and the urgent need to formalize and account for it in solid waste planning. Despite the magnitude of the informal sector in Nigeria, the *National Policy on Solid Waste Management* (NPSWM) 2018 does not offer a clear strategy to maximize its impact, and most state governments do not have plans to integrate the thousands of people who work in the sector on a regular basis.

The solid waste sector faces a variety of social issues that hinder its sustainable development, including hazardous working conditions, low pay, child labor, and social isolation of informal waste workers. As a result, most individuals who perform this crucial public service do so out of need and view it as a temporary or stopgap job.

TS1.1.1.4 Municipal Solid Waste Transport and Transfer Stations

Collection and transport are interdependent components of the MSW value chain. Waste must be collected before it can be transported to waste processing, recycling, or treatment facilities or to final disposal sites. Conversely, collecting waste without the means to transport it renders the effort meaningless. In Nigeria, waste collection trucks are too few to achieve sufficient coverage, and they are not standardized. While municipal waste management authorities have a few compactor trucks, most of the small and medium private sector collectors use medium-size tipping trucks or normal delivery vans. Compartmentalized trucks are rare, meaning that waste is not segregated in transit but is lumped together in the collection trucks.

The limited number of transfer stations in Nigeria leads to prolonged turnaround times for waste transportation. This shortage is primarily due to financial constraints resulting from the lack of a

cost recovery framework that includes tipping fees. In addition, inadequate planning and limited space in urban areas exacerbate the situation.

TS1.1.1.5 MSW Processing, Recycling, and Treatment

Large-scale waste treatment is still in its early stages in Nigeria, due to a lack of both infrastructure and technical expertise. Despite the high cost of these facilities often being cited as a barrier, this could be overcome through successful public-private partnerships (PPPs), a reliable regulatory framework, and credible market opportunities or development grants to scale materials recovery facilities (MRFs).

Nigeria's first and only MRF was established in 2015 through a concessional agreement between Lagos Waste Management Authority (LAWMA) and WestAfricaENRG at the Solous dumpsite in Lagos and serves as an exemplary model. With a capacity of 300,000 MT, the facility recycles various waste materials and produces 16 MW of energy from waste. Similarly, the country has only one known modern composting plant, EarthCare Nigeria Limited, for processing organic waste into fertilizers, also located in Lagos. There are also some successful local waste treatment models that could grow with proper support. However, investment in R&D for sustainable waste recovery and treatment is inadequate. The environmental and health hazards from the poor management of dumpsites in Nigeria, combined with the rapid filling up of these sites, highlight the urgent need for investment in more sustainable waste treatment facilities such as MRFs.

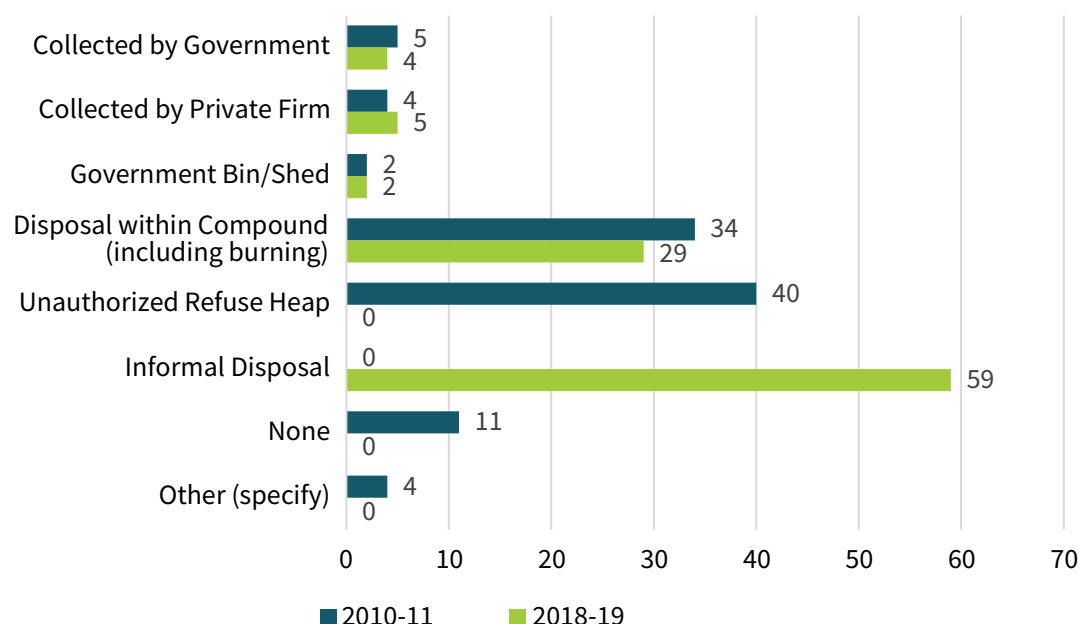
More information regarding plastics processing and recycling is provided in section 2.1 of chapter 2 on plastic waste management in Lagos State.

TS1.1.1.6 Disposal

An interesting insight into access to MSW disposal facilities is presented in a joint study by the National Bureau of Statistics and the World Bank. Figure TS1.1 compares the percentage of households in Nigeria with access to proper MSW disposal sites over an eight-year period from 2010–11 to 2018–19. Most households lack access to proper facilities. In fact, more households lacked access in 2018–19 (59 percent) compared to the 2010–11 period (40 percent) and disposed of their waste informally in open spaces, streets, drains, or water bodies. Almost one-third either burned or disposed of the waste within their compounds in 2018–19.

Despite Nigeria's rapid economic growth during this period, access to refuse collection services has remained unchanged. Lack of proper waste disposal facilities and difficulty accessing approved disposal sites are the main causes of indiscriminate waste disposal in Nigeria. Limited financial capacity to construct and operate sanitary landfills has resulted in intended landfill sites functioning as open dumpsites without any environmental controls. Even when waste treatment facilities are available, they are not distributed geographically or managed effectively. Although three dumpsites in Lagos State have been registered as clean development mechanism (CDM) projects under the Kyoto Protocol to decrease 1.3 MTCO₂e, no projects have been initiated to meet this goal.

Figure TS1.1 Household access to MSW facilities in Nigeria (%)



Source: Calculations based on Nigerian General Household Survey - Panel (NGHS-Panel) 2018–19.
 Note: Number of households surveyed in 2010–11 was 5,047 and 4,877 in 2010-11.

TS1.1.2 Challenges to Nigeria’s Municipal Solid Waste Management Sector

As with other middle-income countries, Nigeria faces challenges to its growing MSW sector.

MSW generation

- Plastics are a growing waste stream with inadequate collection and recycling infrastructure and therefore pose a major challenge in MSW management.
- Lack of awareness among the populace of the impacts of MSW mismanagement and need for behavior change.
- Structural challenges faced by most of the population, such as limited access to safe drinking water, forcing the public to mostly rely on single-use plastic (SUP) bottles or sachets.
- Difficulty in scaling up micro-scale initiatives that reuse waste.
- Failure to transfer responsibility for handling packaging and other materials at their end of life to producers (for example, plastic industries and retailers), which would give consumers and the government the means to manage increasing amounts of waste.
- Poverty and affordability drive the use of plastic sachets for nearly all hygiene, consumable, and cosmetic products, as is the case in India.

Source segregation

- Need for increased investment in waste collection, awareness, and information to improve source segregation.
- Low levels of investment in collection, including bins and vehicles, currently hinder effective source segregation.

- Cost and space constraints of having multiple bins for source segregation in homes.
- Provision of single bins in public areas leads to the misconception that source segregation is not a priority; therefore, clear communication and awareness raising are important.

MSW collection

- Need for improvements in and expansion of infrastructure to keep up with the growth in waste generation, especially in urban areas.
- Accumulation of waste and littering due to limited access to densely populated areas with unmotorable roads, poor waste collection techniques, operational and logistical inefficiencies, and outdated technologies.
- Waste collection services are limited even in low-income areas, such as Makoko, in Lagos due to lack of capacity to pay user fees.

MSW transport

- Costs along the waste value chain are significantly affected by transportation costs and inadequacy of waste collection vehicles.
- Although compactors are expensive to acquire and maintain, more affordable options such as tipping trucks and delivery vans exist; however, these are often old and in poor condition, resulting in frequent downtime.
- In major cities with significant traffic issues, such as Lagos, transport planning and standardized guidelines need to be updated.

Service provision

- Most local governments focus their SWM efforts in keeping mostly the affluent areas clean, therefore concentrating efforts and resources on waste collection and removal from visible areas.
- Despite the lack of capacity and resources for long-term investments in technical skills and infrastructure, there is potential for increased investment in these areas.

TS1.1.3 Recommendations for Nigeria's Municipal Solid Waste Sector

Broadly, the recommendations to improve the MSW sector in Nigeria include the following:

Reducing MSW generation: The Nigerian Government recognizes the potential for circular economy opportunities in the large volumes of recyclable waste, particularly plastic, that are generated in the country, which can lead to pollution reduction, investments, and job creation. It is important to note that these opportunities must not be prioritized over waste reduction and prevention. Reducing the generation of waste in the first place, particularly for SUPs such as beverage bottles, and promoting policies to drive reuse are crucial. Communities must engage, through awareness raising, in source segregation and proper collection. For the organic fraction of the MSW, household-level composting can reduce the amount to be collected as waste, diverting waste from landfills, as discussed in box TS1.1.

Improving waste handling and disposal: A comprehensive MSW disposal management plan is necessary to address operational deficiencies in current dumpsites and future landfills. The integration of the informal sector into landfill and dumpsite operations can help improve waste sorting, create economic opportunities, and improve socioeconomic conditions. For instance, informal sector workers could be organized into cooperatives, enabling them to provide better sorting services and contributing to the formalization and improvement of the overall MSW sector. Such a plan should ideally include the following: (1) Short-term operational plans for waste disposal and long-term plans for new sanitary landfills; (2) Guidelines on improving access, weighing waste, recordkeeping, and fencing, among others; (3) Closure plans for current dumpsites considering the time needed to locate and develop feasible alternatives; and (4) Implementation of monitoring infrastructure such as groundwater monitoring, leachate systems, landfill gas capture, and conducting geo-hydrological studies.

TS1.2 INSTITUTIONAL ANALYSIS OF SWM IN NIGERIA

Section TS1.2.1 outlines the present institutional framework for the MSW sector at the national level in Nigeria. The following section TS1.2.2 sheds light on the institutional challenges of this broad sector in the country. The last section provides recommendations on overcoming these challenges and establishing a successful institutional framework for MSW at the national level.

TS1.2.1 Current Status

The institutional layout of SWM in Nigeria, illustrated in figure TS1.2, and particularly in Lagos State, is described in more detail in chapter 1. Local government councils (LGCs), too, play a crucial role in managing the solid waste process. While the lack of financial and technical capacities has constrained the ability of most LGCs to directly carry out waste collection and treatment, in states such as Lagos, they support the state MSW agencies through coordinating activities and collaborating with private sector players (formal and informal) and interacting with NGOs and community-based organizations (CBOs) regarding SWM in their jurisdiction. The role of state governments and LGCs is further described in box TS1.3.

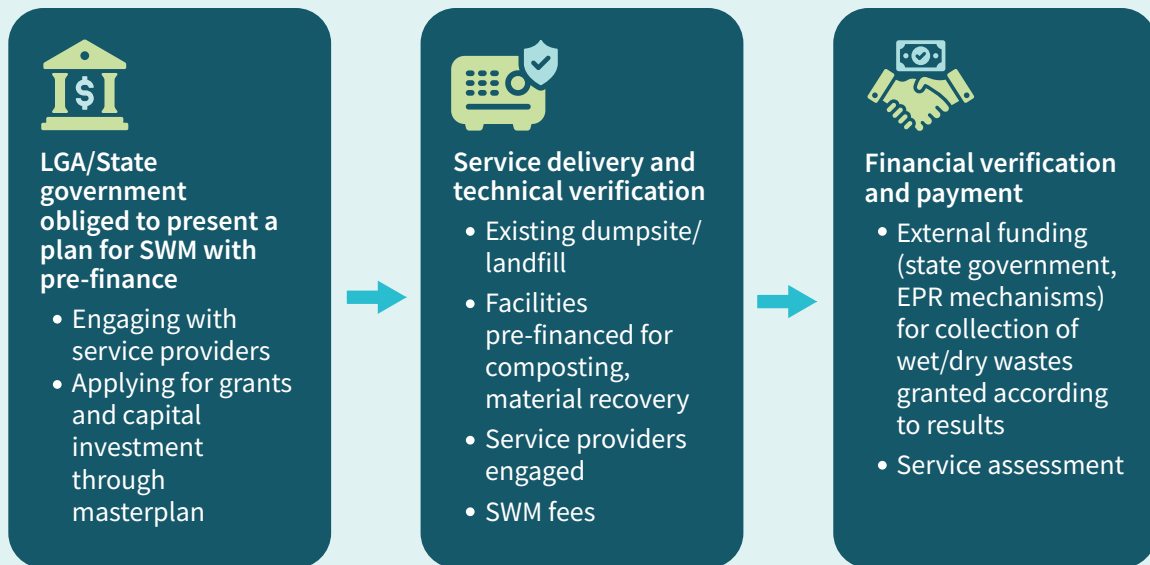
BOX TS1.3 ROLE OF STATE GOVERNMENTS AND LGCs IN MSW MANAGEMENT

Improving MSW services at the local and state level requires external funding and financing, starting with pre-financed execution of a masterplan for each one in an initial phase. The first step is to make sure that a basic operational landfill or controlled dumpsite is functioning, and disposal is ensured. A pre-finance mechanism is crucial to include preparation of MSW Service Improvement Plans fees and revenue collection systems, performance management, implementation of basic measures regarding source segregation and ‘reduce, reuse, and recycle’ (3 R) activities, last but not the least, technical help when designing contractual arrangements with private service providers.

A predefined model for collection, transport, and disposal should be defined in advance as well as a technical national commission (comprising experts from academia, practitioners, decision-makers) for different LGCs and states; rural areas with populations less than 10,000 have different requirements and needs when compared to urbanized areas with over 100,000 inhabitants.

BOX TS1.3 ROLE OF STATE GOVERNMENTS AND LGCs IN MSW MANAGEMENT (contd.)

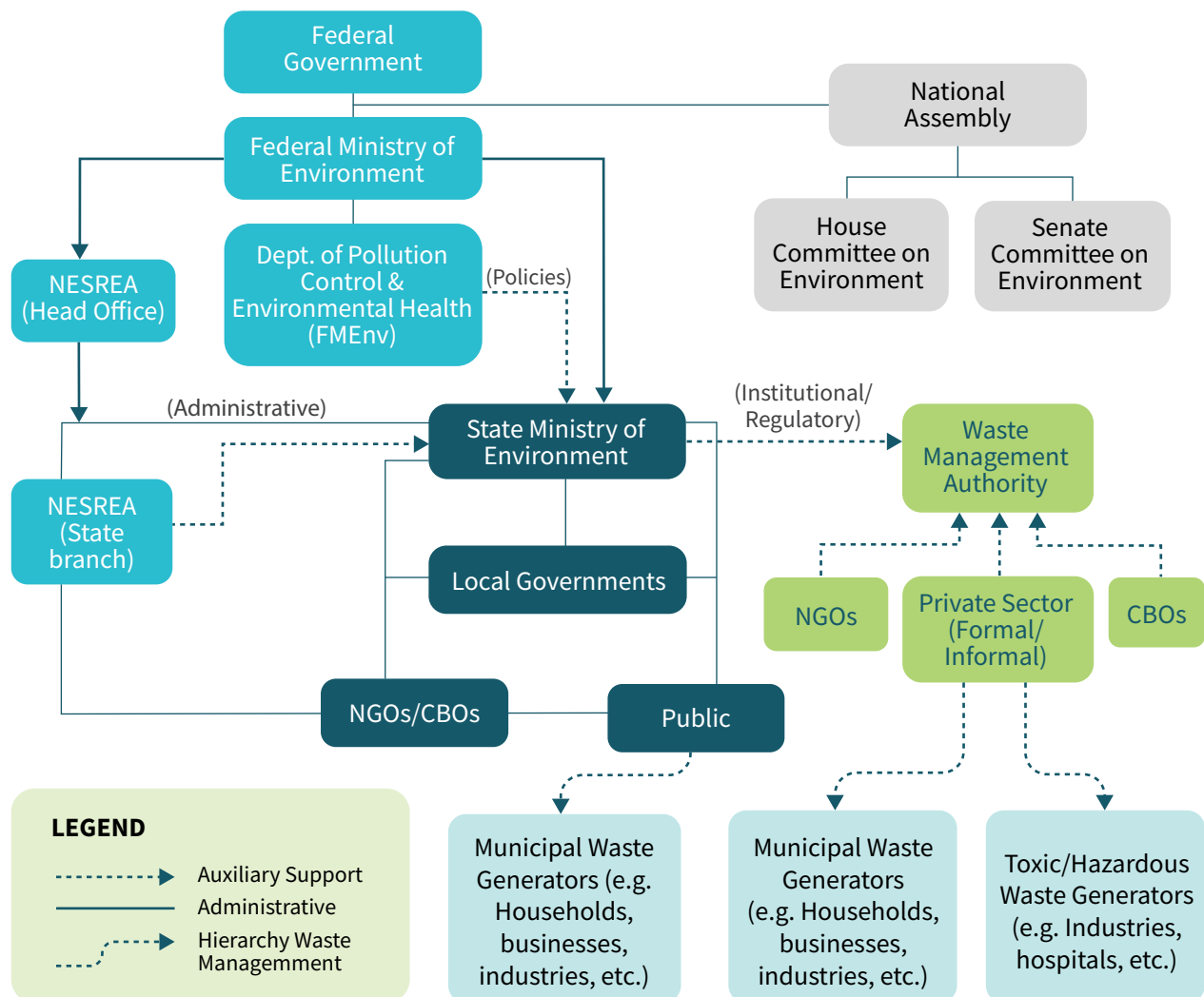
Figure BTS1.3.1 Roles of different institutions



Note: LGA = local government area, SWM = solid waste management.

The technical and financial ability of LGCs to collect fees from beneficiaries and earmarking revenues to pay for service providers is a major challenge. Traditionally in Nigeria LGCs do not play a decisive role, due to lack of financial and political autonomy. However, improving MSW services does not always require more staff, more vehicles, more equipment, or bigger landfill space. A well-planned model with simple, decentralized, robust, and affordable systems, easily managed and maintained by current staff, is a must. A separate MSW department is a structure that effectively allocates responsibility for operations, projects, and supervision. The three individuals accountable for these service lines should be led by a senior manager with skills in strategy development, technical leadership, and operations. Figure BTS1.3.1 gives a brief overview of the role of different institutions in SWM.

Figure TS1.2 Current institutional layout of SWM in Nigeria



Source: Adapted from UNIDO 2021.

Note: CBO = community-based organization, FMEEnv = Federal Ministry of Environment, NESREA = National Environmental Standards and Regulations Enforcement Agency, NGO = nongovernmental organization.

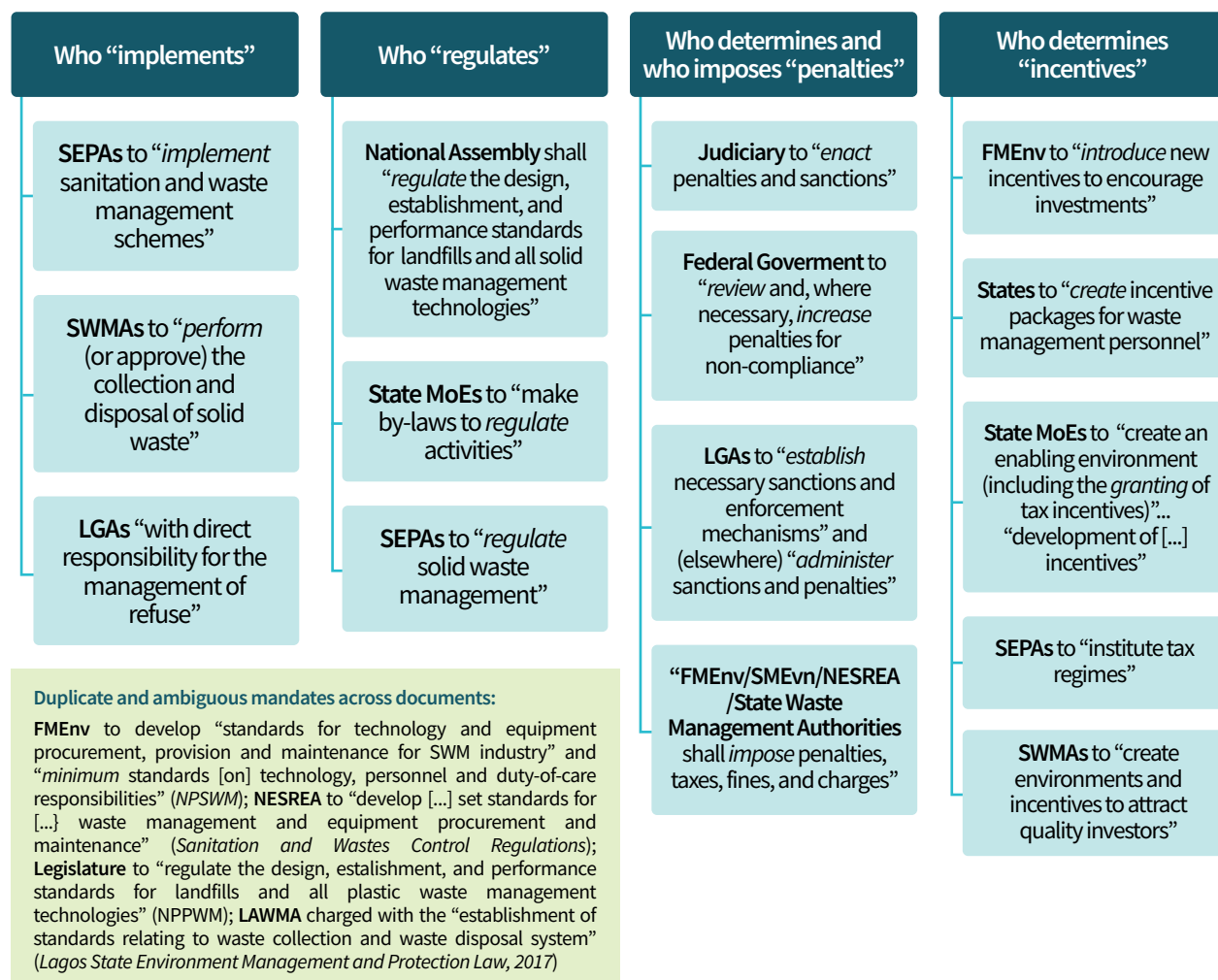
TS1.2.2 Challenges

Although Nigeria faces challenges related to institutions for MSW, it has made strides in coordination and related mechanisms. Some challenges it currently faces include the following:

- **Need for clear mandate among different actors, as shown in figure TS1.3, to avoid overlap and duplication of efforts.** An example of this is the legal dispute between the Federal Capital Development Authority (FCDA) and the Abuja Environmental Protection Board (AEPB) over the right to collect fees for waste collection services (Nwachuku 2021).
- **Need for harmonization of policies across the entire sector, which has discouraged capital investments in the sector.**
- **Poor oversight and enforcement of existing policies and regulations to improve overall performance and service delivery.**

- Inadequate funding of LGCs as well as transparent management of budgets.
- Lack of data management and performance indicators, impeding the regulator's ability to impose fines and sanctions.

Figure TS1.3 Delineation of mandates related to MSW governance in Nigeria



Source: World Bank.

Note: FMEv = Federal Ministry of Environment, LAWMA = Lagos Waste Management Authority, LGA = local government areas, LS-MoEnv = Lagos State Ministry of Environment, MOE = Ministry of Environment, NESREA = National Environmental Standards Regulations and Enforcement Agency, NPPWM = National Policy on Plastic Waste Management, NPSWM = National Policy on Solid Waste Management, SEPA = state environmental protection agencies, SWMA = solid waste management authorities, SWM = solid waste management.

TS1.2.3 Recommendations

The following recommendations are provided to enhance the capacity of Nigeria's MSW institutions for effective management of MSW:

- Nigeria's solid waste sector requires a national strategy to meet its diverse needs and involve the government, private sector, and other nongovernmental actors.

- **National Environmental Standards Regulations and Enforcement Agency (NESREA) plays a critical role as Nigeria's waste management regulator and, along with its supervising agency (FMEnv), needs capacity building, funding, and political support.** NESREA should operate as a fully empowered regulator with binding powers and an advisory role to the government on national strategy and legislation, to address issues such as facilitating investments, providing technology advice, assessing training needs, and monitoring standards.
- **The establishment of a National Waste Management Committee (NWMC) comprising representatives from relevant government bodies, private sector, and interest groups could ensure coordination and collaboration with state governments.** It would serve as a clearing house to ensure state-level involvement in the development of national policies, regulations, legislations, and initiatives, such as extended producer responsibility (EPR) and key performance indicators (KPIs). The council would ensure a collaborative formulation of policies to help avoid needless duplication of national policies at the state level or to help adapt national policies for states.
- **LGCs need support from state and federal authorities to provide effective MSW service delivery.**
- **Up-front financial assistance and sustainable funding initiatives such as EPR can attract private sector investment and improve waste management.**
- **The regulator should provide technical guidelines, conduct studies, and facilitate stakeholder engagement in the sector.**
- **Simplified institutional arrangements and flow of funds are necessary for effective execution of waste management policies.**
- **NESREA and other waste authorities under the Lagos State Ministry of Environment (LS-MoEnv) should coordinate or harmonize waste management actions, data, norms, and standards in the short term.**

TS1.3 POLICIES AND REGULATIONS RELATED TO SWM IN NIGERIA

Section 1.2.2 outlines a timeline of the existing national level policies, regulations, and legislation relating to SWM in Nigeria which came into force between 1988 and 2020. A brief comment is also provided on the essence of each instrument in the timeline (table 1.7). This section provides a brief review of the key challenges (section TS1.3.1) and recommendations (section TS1.3.2).

TS1.3.1 Challenges

The challenges related to MSW policies and regulation in Nigeria include the following:

- **The lack of enforceable regulations for legislative objectives such as waste prevention and reduction of plastic waste makes them difficult to implement.**
- **Need for clear organizational policies, performance evaluation, and enforcement roles to improve waste management.** Coordination between various agencies (for example, Lagos State Environmental Protection Agency [LASEPA], Lagos Waste Management Authority [LAWMA], NESREA, Kick Against Indiscipline [KAI]) needs to be enhanced.
- **Waste management laws and regulations, inspection plans, and standards must be developed**

with more focus on effectiveness, compliance, and enforcement.

- **Lack of equity and inclusivity for the informal sector, with need for regulations and compliance from all stakeholders.** For instance, punishment and fines tend to be levied disproportionately in low-income communities where waste collection coverage is also low.
- **Waste collection performance by private sector partnerships (PSPs) is neither evaluated nor are contracts fully enforced to prevent illegal disposal.**
- **Households lack access to affordable containers for waste storage on their premises, as the cost of bins is prohibitive for many families.** While there are regulations for household bin usage and standardization, this is not enforced.
- **Recovery of waste management costs is a challenge.**
- **Public education and outreach must be improved to engage all stakeholders.**

TS1.3.2 Recommendations

Any national policy or strategy on SWM must be tailored to Nigeria's social, political, and economic realities and must also strengthen the government's regulatory and enforcement capacity. Improvements in efficiency and service provision can be brought about by the following:

- **Improving the clarity and coherence of the policy and regulatory framework and strengthening enforcement capacity, as this is key to effective administration of the sector.**
- **Streamlining and clarifying the responsibilities of various agencies involved in regulatory and operational issues at federal, state, and local levels.** This minimizes duplication, conflict, and inefficiencies that may impede the performance of the MSW sector.
- **Strengthening the administrative and technical capacities of the relevant government agencies to effectively adapt and implement best practices in sustainable MSW, including transitioning to a circular economy.**
- **Ensuring financial sustainability of the sector, through user fees and creating financing and funding mechanisms (for example, EPR, subsidize compost) to ensure that state and local authorities can meet guidelines for proper waste collection and disposal.** Establish a national guideline for fees and consider indirect charging via a utility (for example, electricity), as in Maputo, Mozambique or Nairobi, Kenya.
- **Improving private sector participation through effective, transparent, and accountable contracts.** There is a need for an approach that incorporates both large waste companies and micro, small, and medium enterprises (MSMEs)/CBOs to improve scale, efficiency, and coverage. By integrating the services of MSMEs and CBOs, services can be extended to neighborhoods that are otherwise difficult to access, while large waste companies can contribute technology and expertise to these efforts and in other aspects along the waste value chain.
- **Unlocking market opportunities for waste commercialization and recycled products, which will valorize 'waste' and accelerate waste recovery and recycling.** For example, a policy mandating minimum recycled content for SUP packaging, such as polyethylene terephthalate (PET) bottles, will stimulate local demand for recycled polyethylene terephthalate (rPET), attract investments and boost recovery of PET bottles.

- Improving local capacity for fabrication/manufacturing of waste management tools, equipment, and vehicles, including bins, vehicles, and sorters.
- Discouraging the shift from returnable and refundable systems (for example, glass bottles) to SUP.
- Acknowledging the role of informal sector and developing policies and regulations related to this.

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TOPIC SHEET 2

PLASTIC WASTE MANAGEMENT IN NIGERIA



Further information on this topic is available at:
Improving Solid Waste and Plastics Management in Lagos State:
Guidance Document on Implementing Extended Producer
Responsibility for Plastic Packaging (Internal report).

Nigeria's demand for plastics is increasing rapidly—over the last decade per person plastic consumption has grown significantly. As domestic plastic consumption has outpaced production, the country imports 70 percent of its needs and is a leader in plastic raw materials imports in Africa. At the same time, Nigeria is also the biggest generator of plastic waste in Africa, estimated at 1.5 million metric tons (MT) in 2017. In 2010–20, per person consumption of plastic in Nigeria grew by 4.81 percent, from 6.5 kg in 2017, and was estimated to be 7.4 kg in 2020, due to increasing demand for packaging, electrical and electronics, and automotive industries. Single-use plastics (SUPs) are widely used in Nigeria for their convenience and value addition. For example, approximately 70 percent of Nigerians consume and dispose of at least one plastic sachet of drinking water daily given the limited access to municipal water supply.

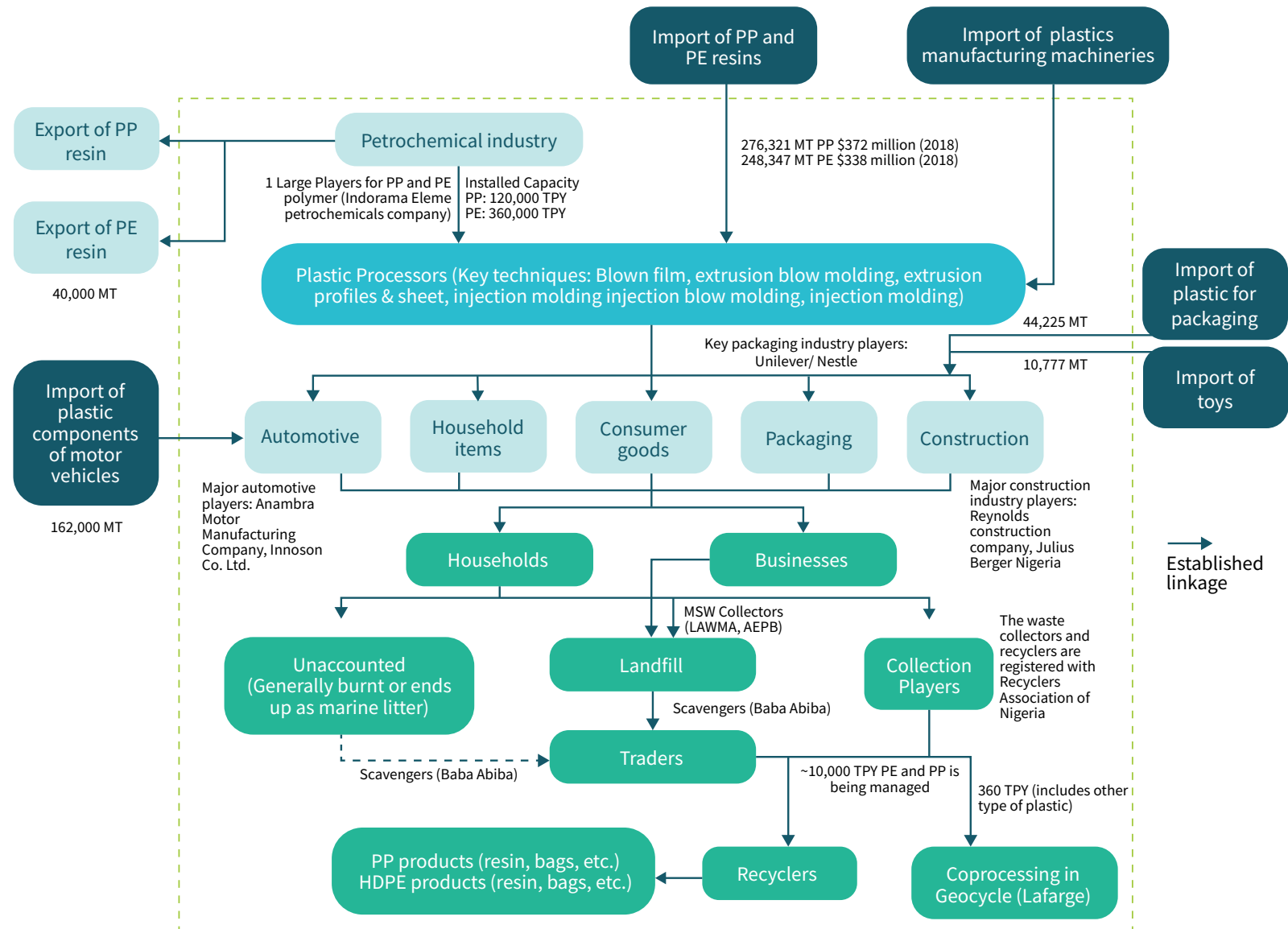
As the country's leadership recognizes the need for a circular economy for plastics, it is crucial to understand the plastic waste management system. The entire plastic value chain is discussed in section TS2.1. Weak implementation of existing policies at the national level, mismanagement of municipal solid waste (MSW) systems at the local level, and negative behavior related to managing waste have resulted in a serious plastic pollution problem for the country. With a long coastline (853 km) and densely populated coast (estimated to account for 25 percent of the national population), Nigeria also contributes to marine plastic pollution, with over 18,000 MT of plastic waste leaks into the ocean annually (Meijer et al. 2021).²⁹

TS2.1 PLASTIC VALUE CHAIN IN NIGERIA

The plastics value chain encompasses every step from the production and importation of plastic polymers to the final disposal of used plastics, and in Nigeria involves crucial stakeholders such as primary plastic raw material manufacturers, primary and secondary consumers, and plastic waste collectors, recyclers, traders, and operators responsible for treatment and disposal, as shown in figure TS2.1. The plastic value chain is illustrated in figure TS2.1.1, while the challenges to improved plastic waste management are shared in the subsequent section. Section TS2.1.3 shares recommendations to improve plastic waste management in Nigeria.

²⁹ For more information on data related to plastic waste emitted to the ocean, visit the website of <https://ourworldindata.org/grapher/plastic-waste-emitted-to-the-ocean?country=BGD~CMR~PHL~CHN~IND~NGA~BRA~LKA>. Research concerning marine plastic pollution in Nigeria is scarce and displays significant disparities. For instance, in 2015, Jambeck et al reported that Nigeria contributed 0.13-0.34 million MT of plastic waste to the marine environment. In 2019, the Lagos State Commissioner for the Environment stated that Lagos alone contributes 450,000 MT of plastic waste to the ocean annually.

Figure TS2.1 Stakeholders along the plastic value chain in Nigeria



Source: PWC 2019.

Note: AEPB = Abuja Environmental Protection Board, LAWMA = Lagos Waste Management Authority, MT = metric tons, PE = polyethylene, PP = polypropylene, HDPE = high density polyethylene, TPY = tons per year.

TS2.1.1 Current Status of the Plastic Value Chain in Nigeria

- 01 Domestic manufacturing of plastic
- 02 Plastic imports
- 03 Plastic use
- 04 Plastic waste generation
- 05 Plastic waste collection and transport
- 06 Plastic waste treatment and disposal

Domestic Manufacturing of Plastic

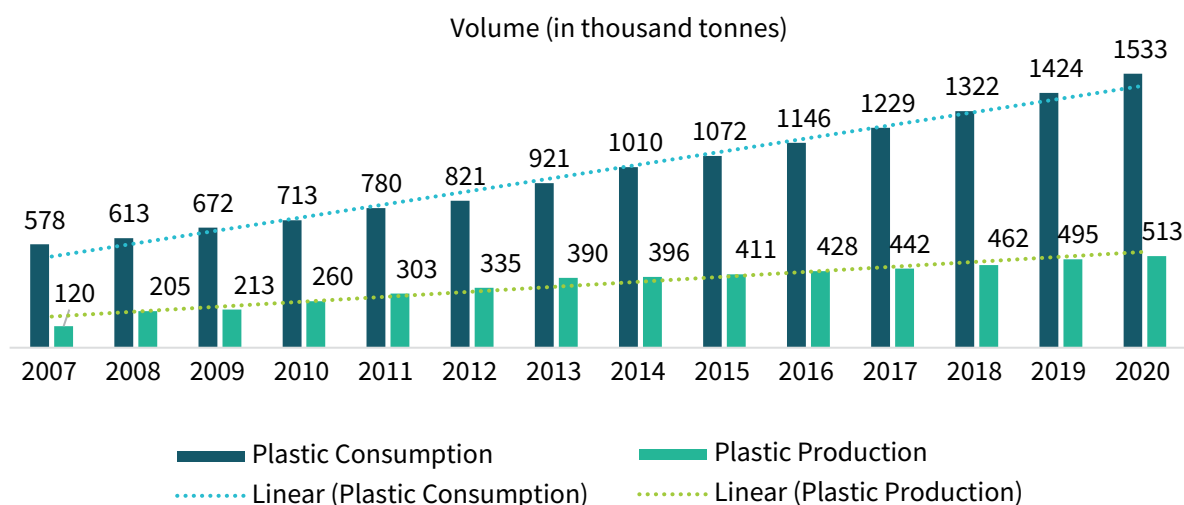
Plastic resin production in Nigeria has grown approximately 10.3 percent annually, from 120,000 MT in 2007 to 436,000 MT in 2018 and was estimated to be 523,000 MT in 2022. The country's production capacity will triple with two petrochemical plants being developed by the Dangote Group [900,000 tons per year (TPY)] and EngéePET (30,000 TPY), both expected to come on stream in 2023 (Dangote 2023). Further, EngéePET's facility will produce recycled plastic resin (IFC 2020). Domestic manufacturing of plastic products is for packaging materials such as polyethylene terephthalate (PET) bottles, bottle caps, milk containers, and, importantly, SUP plastic bags

as well as household products. Over 3,000 registered plastic production companies have become increasingly sophisticated as new technologies are introduced.

Plastic Imports

Despite the growth of the domestic plastic manufacturing industry, roughly 70 percent of plastics used in Nigeria are imported. This increase in imports of polymers is due to growth in plastic consumption by the packaging and the construction industries. The trend of plastic production, consumption, imports, and exports in Nigeria is shown in figure TS2.2. The country is the second largest importer of plastic resins and finished products in Africa.

Figure TS2.2 Plastic production and consumption in Nigeria, 2009–20



Source: Statista Research Department 2023a, 2023b.

Plastic Use

Nigeria is a leading plastic consumer in Africa, with the packaging industry being the largest consumer of plastic at 55 percent. High consumption of SUPs, such as bags, containers, cups, and food packaging, contributes to this. The construction industry, which uses plastic products such as pipes, fittings, boards, and doors, is the second largest consumer at 16 percent, followed by the automobile sector at 6 percent. Data on the consumption of plastic by sector from 2009 to 2020 can be seen in table TS2.1. The per person consumption of plastic in Nigeria grew by 4.81 percent between 2010 and 2020 and was estimated to be 7.4 kg per year in 2020 (ChemAnalyst 2021).

Table TS2.1 Plastic consumption by sector in Nigeria, 2019–20

Consumption by application (*)													
Packaging	%	53.6	51.7	51.9	51.4	52.5	52.7	52.9	53.4	53.8	54.1	54.3	54.4
Automotive	%	6.3	6.2	6.1	6.1	5.9	5.8	5.7	5.7	5.7	5.6	5.5	5.5
Construction industry*	%	14.5	16.0	16.4	16.8	16.9	17.0	16.8	16.5	16.3	16.2	16.3	16.4
Electrical/ Electronics and telecommunication	%	3.4	3.5	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3	3.3
Others	%	22.2	22.6	22.2	22.1	21.4	21.2	21.1	21.1	21.0	20.8	20.6	20.5
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: UNIDO 2021.

Plastic Waste Generation

The Lagos Bureau of Statistics (2020) estimates that Nigeria generates at least 1.5 million MT of plastic waste annually, that is, 7.5 kg per person—although it is believed that the actual amount is higher. Based on a conservative estimate, plastic waste is expected to reach approximately 3.3 million MT by 2040, more than doubling the present per person value.

Plastic Waste Collection

Waste collectors serve as a link between waste producers and waste processors. In Nigeria, like other developing countries, the informal sector plays a vital role in waste collection, including plastic waste. The private sector also collects recyclable waste, including plastic, for a fee and processes plastic waste. Some informal collectors also provide waste collection services for residents for a fee, often in areas where government agencies or their contractors cannot. The recyclable fractions are sorted and sold to aggregators while the residual waste is indiscriminately dumped, leading to the creation of numerous illegal dumpsites across cities in Nigeria. Waste pickers play a key role in recovering reusable and recyclable materials both on-site and off-site. Box TS2.1 presents a discussion on formalizing the informal sector in plastic waste management.

Plastic Waste Recycling in Nigeria

While private investors are taking advantage of the opportunities to set up plastic recycling plants, the number, scale and spread of such plants are not substantial enough to effectively address the quantum of accumulated and incremental plastic waste in the country. Therefore, in addition to

boosting recycling capacity, Nigeria also needs to take measures to reduce the growth of especially SUPs through incentivizing recycled plastics and plastic substitutes. To improve the recycling of plastic waste, priority must be given to phasing out hard-to-recycle and non-recyclable plastics, mandating use of recycled plastics by high plastic consumption industries such as packaging and construction, creating a favorable investment climate for the growth of the plastic recycling value chain, and establishing and enforcing globally compliant recycling standards for all polymers to unlock export opportunities for locally recycled plastics.

Plastic Waste Disposal

Uncollected plastic waste that is not recycled or removed from the waste stream accumulates as litter or at dumpsites and is burned openly, producing dioxins, furans, polychlorinated biphenyls, black carbon, and greenhouse gases (GHGs). Plastic waste also finds its way into water bodies, clogging drains and increasing the risk of urban flooding before eventually reaching the ocean. In 2009, thick and dark smoke from burning plastic components in electronics was reported to move in spirals up the sky in computer villages in Lagos State (Babayemi and Dauda 2009).

BOX TS2.1 FORMALIZING THE INFORMAL WASTE SECTOR OF PLASTIC WASTE MANAGEMENT

Incorporating the informal sector MSW would not only minimize indiscriminate dumping and improper waste disposal and improve data collection but also increase government revenue. In Lagos State, Lagos Waste Management Authority (LAWMA) established the Lagos Recycle Association in May 2021 to engage key players like cart and barrow pushers in the formal waste value chain. RecyclePoints, a Lagos-based waste recycling and social benefits venture, launched the Waste Pickers Initiative, in collaboration with the World Bank, will include informal workers in the waste value chain.

Although the informal sector plays a crucial role in plastic waste management, so far there are few mechanisms to integrate informal workers. These workers, including waste pickers, buyers, and aggregators, collect, sort, transport, recycle, and sell large volumes of plastic waste, either as individuals or through self-organized associations. However, institutional systems to enable their participation are lacking; therefore, cooperation between local authorities and informal workers is limited and often relies on support from nongovernmental organization (NGOs).

Socially inclusive models can support local authorities' efforts to improve primary collection and transport systems, increase source segregation, and enhance recycling efficiency, particularly for the large fraction of recyclable plastics that are currently downcycled or mismanaged.

Integration in rural areas and small towns

Waste picker integration in smaller towns and rural areas faces different challenges. Well-functioning buy-back centers play a stronger role and have more influence than in cities. In smaller towns and rural areas buy-back centers play a central role, but it is crucial that they commit to the waste picker integration principles, pay waste pickers fair prices, and are transparent. The introduction of extended producer responsibility (EPR) to ensure that smaller towns and rural areas are not left behind and that recyclables are purchased from these areas is essential to integrating waste pickers (Nigeria DEFF and DST 2020).

Note: For more information on RecyclePoints, visit the official website on <http://www.recyclepoints.com/>.

TS2.1.2 Challenges

Nigeria faces some key challenges in plastic recycling and recovery, which are described in this section.

- **Lack of source segregation:** Waste segregation at source is hampered by low awareness and infrastructure. For instance, wastebins, where available, and collection trucks are not designed for segregation, that is, no compartmentalization, resulting in a low ratio of sorted waste to total national MSW collection. As a result, waste pickers sift through wastebins and dumpsites to recover recyclables, including plastics, which become contaminated and, therefore, harder to recycle. Although the NPPWM (2020) recognizes the importance of implementing source segregation, the collection models proposed refer to communal depots in high-density, low-income areas which are ill-suited for sorting activities. The policy also does not specify the nature of segregation, and voluntary programs often fail due to low participation rates. Some households have begun sorting plastic waste to increase its value for recycling and collaborate with waste pickers.
- **Low or no market value:** Collection of certain types of plastics, such as plastic bags and film, is difficult and generates less income for waste pickers worldwide, because they are lightweight and require large quantities to be collected to make the process viable. The situation is no different in Nigeria. Some plastics are recycled into black nylon sheets for light shopping bags, protective sheets at construction sites, and planting bags for farmers. However, some other plastics such as multi-layer films and polystyrene (PS), which is popularly known by the brand name Styrofoam, are hard to recycle and have no market value currently in Nigeria.
- **Risk to quality of recycled plastics:** Due to high contamination levels from plastic recovery from mixed waste and at dumpsites, the quality of recycled plastics tends to be low, if appropriate recycling standards are not complied with. The cost of cleaning and the wastage from rejected feedstock results in low financial yields for plastic recyclers, making virgin plastics more cost-effective. This presents a major obstacle to the use of recycled plastics by potential user industries and hinders the development of a circular system. Low financial returns discourage recyclers from investing in technologies, training, and operations that could improve the quality of their outputs.
- **Recycled packaging plastics, particularly PET, have struggled to compete with virgin plastics in Nigeria due to their higher cost and lack of regulatory requirements for recycled content,** despite the establishment of national recycling standards for food-grade recycled polyethylene terephthalate (rPET) 2019 and the presence of local rPET producers subsequently. As a result, the market is not yet geared to drive sustainable recycling business models on a large scale, highlighting the need for policies and subsidies to address such market failures. This would also help reduce the quantity of mismanaged plastics and associated pollution, while increasing plastic waste collection.
- **Disposal of plastic waste by dumping and open burning results in a loss of value such as energy recovery opportunities or recycled plastics as materials for various industries.** Using plastic waste as an energy source (for example, refuse derived fuel [RDF] for the cement industry) needs further demonstration and scalability.

TS2.1.3 Recommendations

For the entire value chain to work, it is crucial to develop integrated strategies that tackle plastic waste as part of MSW and to optimize treatment and value creation and minimize disposal of plastics and other waste components. Some measures that can be applied to SUPs, which are particularly problematic, are summarized in table TS2.2.

Table TS2.2 Summary of measures that can be applied to SUPs

Single-use plastic items	New and existing taxes	Deposit refund system	Extended producer responsibility
Beverage plastic bottles	A 'plastic pollution' tax per bottle can be used to encourage systems in which bottles are reused and to discourage single use.	Effective to sustain the use of refillable bottles by manufacturers; achieves high rates of return/recycling of single-use bottles.	EPR applies to drinks producers and/or retailers to achieve high collection rates for single-use containers.
Lightweight plastic carrier bags	A 'plastic pollution' tax could be levied on the use of disposable plastic carrier bags by retailers.	No relevant application. It would be too costly to pay refunds on such small, low-value items.	Retailers obliged to charge customers for each single-use bag and to provide customized bags from alternative bio-based materials within an agreed timeframe.
Takeaway food boxes	A new tax could be levied on the sales by the manufactures, fostering investment into reusable/bio-based food boxes.	Deposit refund systems are feasible for reusable takeaway, with citywide branding of boxes and companies managing them for a small fee.	Retailers EPR to charge customers for each box rather than providing single-use takeaway food packs for free.
Disposable cutlery, plates, stirrers, straws	A tax can be used to replace these plastic items with bio-based materials.	No relevant application. It would be too costly to pay refunds on such small, low-value items.	No EPR is usually applied to such items; however, these plastic items should be considered in calculating a company's plastic footprint.
Sachet water packing	A 'plastic pollution tax' could be levied on the production of sachet water bags to finance its collection and replacement with bio-based polymers.	No relevant application.	EPR innovation is required in this sector, making the collection and delivery of empty water sachets more attractive.

Source: World Bank.

Note: EPR = extended producer responsibility.

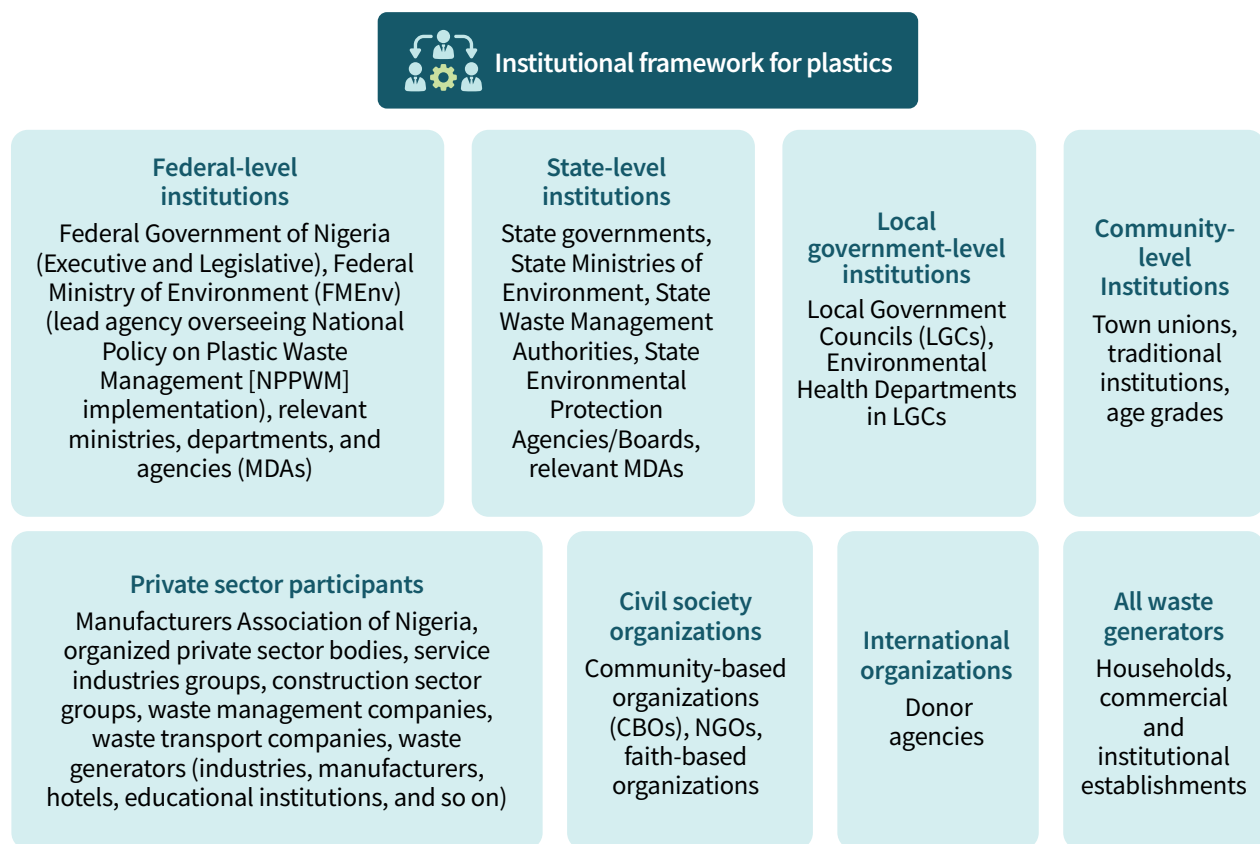
TS2.2 INSTITUTIONAL AND POLICY FRAMEWORK FOR PLASTIC WASTE MANAGEMENT IN NIGERIA

Section TS2.2.1 briefly describes the current institutional structure for plastic life cycle management in Nigeria. The next section highlights the challenges encountered in setting a framework, implementing institutions, and bringing stakeholders, both upstream and downstream, together to manage plastics effectively. The subsequent section offers recommendations on how to surmount these obstacles and establish a successful institutional framework that promotes a circular economy for plastics.

TS2.2.1 Current Status of Institutional Framework

The institutional framework for plastic life cycle management in Nigeria, according to the country's National Plastic Waste Management Policy is shown in figure TS2.3 (FMEv 2020).

Figure TS2.3 Institutional framework for plastics in Nigeria



Government institutions are the most powerful stakeholders in Nigeria's solid waste value chain. They define and influence policy direction on waste management at the national and state levels. The same MDAs responsible for bulk MSW oversee plastic and other resource recycling activities.

TS2.2.2 Challenges

Policies related to plastic waste management in Nigeria face various challenges that could be broadly summarized into weak policy framework and weak implementation. Specific challenges to overcome include the following:

- SUP bans are envisaged in the national plastics policy, but no concrete steps have been taken toward implementation. A major impediment is the lack of a national-level policy that standardizes the definition of SUPs and recognizes regional variations in plastic consumption.
- Despite the release of operational guidelines for an EPR scheme by National Environmental Standards Regulations and Enforcement Agency (NESREA) in 2014, EPR implementation has been voluntary and rudimentary within the three pilot sectors and therefore has made negligible impact. The importance, challenges, and prospects of the EPR scheme in Nigeria are discussed in detail in chapter 3.
- Efforts to promote behavioral change and increase public awareness have been inconsistent and often lacked a solid foundation in behavior change analysis.
- A review of the policies in the NPSWM 2018 found that the most important measures, such as funding mechanisms, planning tools, levies on SUPs, and taxes, have not yet been implemented.
- Consequently, the target outcomes for 2020–22 were not achieved.
- EPR and deposit refund schemes (DRS) are yet to be implemented, although NESREA published EPR operating guidelines in 2014. The private sector does not have any immediate requirements or justification to invest and shift to sustainable production and packaging business models, resulting in excessive waste.
- The *Plastic Bags Prohibition Bill* (2019) represents a crucial step toward addressing the use, manufacture, and import of plastic bags with the threat of fines and even imprisonment, like other countries. However, the bill could benefit from including affordable alternatives to plastic bags and market-based instruments.

TS2.2.3 Recommendations

Plastic pollution is primarily a result of market and policy failures in plastic production, consumption, and disposal. Therefore, it is imperative to implement plastics policies and other measures to address these problems. The economic impact of plastic waste goes beyond the loss of economic value of the material and also includes the costs of cleanup and losses to tourism, fisheries, and shipping sectors. While it is widely accepted that plastic waste must be repurposed, recovered, or recycled, a national plan for plastic waste management must aim to be holistic and address Nigeria's specific needs. It is essential that policies to curb plastic waste generation are aligned with broader solid waste management (SWM) measures.

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TOPIC SHEET 3

EMISSIONS OF PARTICULATE MATTER AND GREENHOUSE GASES FROM MUNICIPAL SOLID WASTE IN LAGOS STATE

Further information on this topic is available at:
*Improving Solid Waste and Plastics Management in Lagos State:
Assessing Air Pollution and Greenhouse Gas Emissions* (Internal report).

The mismanagement of solid waste exacerbates environmental pollution in the major cities in Nigeria, especially Lagos. Over 50 percent of municipal solid waste (MSW) remains uncollected, leading to littering, clogged drains, open burning, and marine pollution. This causes a wide range of environmental and public health problems. The objectives of this assessment are to measure emissions of greenhouse gases (GHG) and particulate matter (PM_{2.5} and PM₁₀) from the mismanagement of plastic waste in Lagos State, which in this case refers to open burning of waste.

Open burning is a common, but unfavorable, practice used to dispose of solid waste in many parts of the world, particularly in low- and middle-income countries. This practice is harmful to both human health and the environment. When solid and plastic wastes are burned, toxic chemicals are released into the air, including dioxins, furans, and PM. These pollutants can cause respiratory problems, cancer, and other health issues. Additionally, open burning contributes to air pollution and GHG emissions, which exacerbate climate change.

Section TS3.1 discusses how MSW affects air quality and climate change emissions, and, subsequently, public health and related costs. The subsequent section summarizes the key findings of the assessment, providing the total emissions from the sector and related costs. The last section provides recommendations to decrease impacts of emissions from the MSW sector in Lagos State. Box TS3.1 summarizes the impact of mismanaged MSW on air, water, soil quality and climate change.

BOX TS3.1 ENVIRONMENTAL PROBLEMS LINKED TO MISMANAGED MSW

- **Littering:** Uncollected waste often ends up as litter, creating unsightly and unsanitary conditions.
- **Water pollution:** Leachate, a toxic liquid that seeps from mismanaged waste disposal sites, contaminates groundwater and surface water.
- **Air pollution:** Open burning of waste releases toxic chemicals and PM into the air, causing air pollution and posing a threat to public health.
- **Soil contamination:** Leachate also contaminates soil, causing damage to ecosystems; plastics in the waste degrade into microplastics.
- **Marine pollution:** Mismanaged waste often ends up in the ocean, and the degradation of plastics into smaller particles causes harm to marine life and ecosystems and ends up in the food chain.
- **Climate change:** Dumpsites are a significant source of methane, a potent GHG that contributes to global warming.

TS3.1 CURRENT SCENARIO

A recent study by the World Bank provided some insightful findings related to disposal of MSW in dumpsites and open burning (including biomass burning) [World Bank 2024e (internal report)]. First, dumpsites and open burning are the largest contributors to PM (primarily PM_{2.5}) in Lagos State. Second, they are the third largest source of GHG emissions in the state, accounting for about 16 percent of total GHG emissions (approximately 4.02 million metric tons [MT] per year of CO₂e with

a 100-year global warming potential [GWP]). The economic cost of PM_{2.5} emissions in Lagos State are estimated at \$1.2 billion to \$2.3 billion per year, equivalent to 1.6–3.2 percent of the state’s GDP. Therefore, it is imperative to quantify emissions from the MSW sector and explore ways to reduce their public health and economic impact. Refer to box TS3.2 on the methodology used to calculate PM and GHG Emissions from MSW in this study.

Plastic waste is an important constituent of MSW regarding PM and GHG emissions. In Nigeria, only about 6 percent of plastic waste is recovered, while the unrecovered 94 percent is mismanaged and lead to all kinds of environmental pollution. For instance, an estimated 14.7 percent of total MSW generated in Nigeria is openly burned (Okafor et al. 2022). In Lagos State, plastic waste constitutes 23–29 percent of the MSW collected and disposed of at dumpsites (Akpokodje et al. 2022). Therefore, it is also necessary to measure the contribution of plastic waste mismanagement to the environment with respect to emissions of air pollutants and GHGs. Map TS3.1 shows the current waste facilities in Lagos State. It shows that most waste disposal sites are concentrated around the Lagos Metropolitan Area, while the more rural areas tend to have little to no facilities for waste disposal.

BOX TS3.2 METHODOLOGY TO CALCULATE PM AND GHG EMISSIONS FROM MSW IN LAGOS STATE

The study undertook a comprehensive review of available literature to gather data on emissions estimations from landfills/dumpsites and open burning of waste. Data about MSW and plastic waste were gathered from a review of studies conducted by the World Bank for the Lagos Pollution Management and Environmental Health (PMEH) Program, solid waste characterization study in Lagos, Nigerian solid wastes, and plastics management institutional analysis. Methane (CH₄) emissions—the main GHG as released from waste disposal sites—were calculated using the parameters and equations for calculating CH₄ emissions from solid waste disposal sites in the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (Towprayoon et al. 2019).

The calculation of fugitive emissions (PM_{2.5} and PM₁₀) from landfills/dumpsites was based on the *EMEP/EEA Air Pollutant Emissions Inventory Guidebook 2019* (Trozzi, Kuenen, and Hjelgaard 2019). The computed PM_{2.5} and PM₁₀ estimates were then allocated based on the percentage composition of the types of waste in Lagos State (ARIA 2021). The estimates of PM_{2.5} and PM₁₀ emissions from open burning relied on the general equation of emission estimation given as follows:

$$E_i = W_b \times EF_i$$

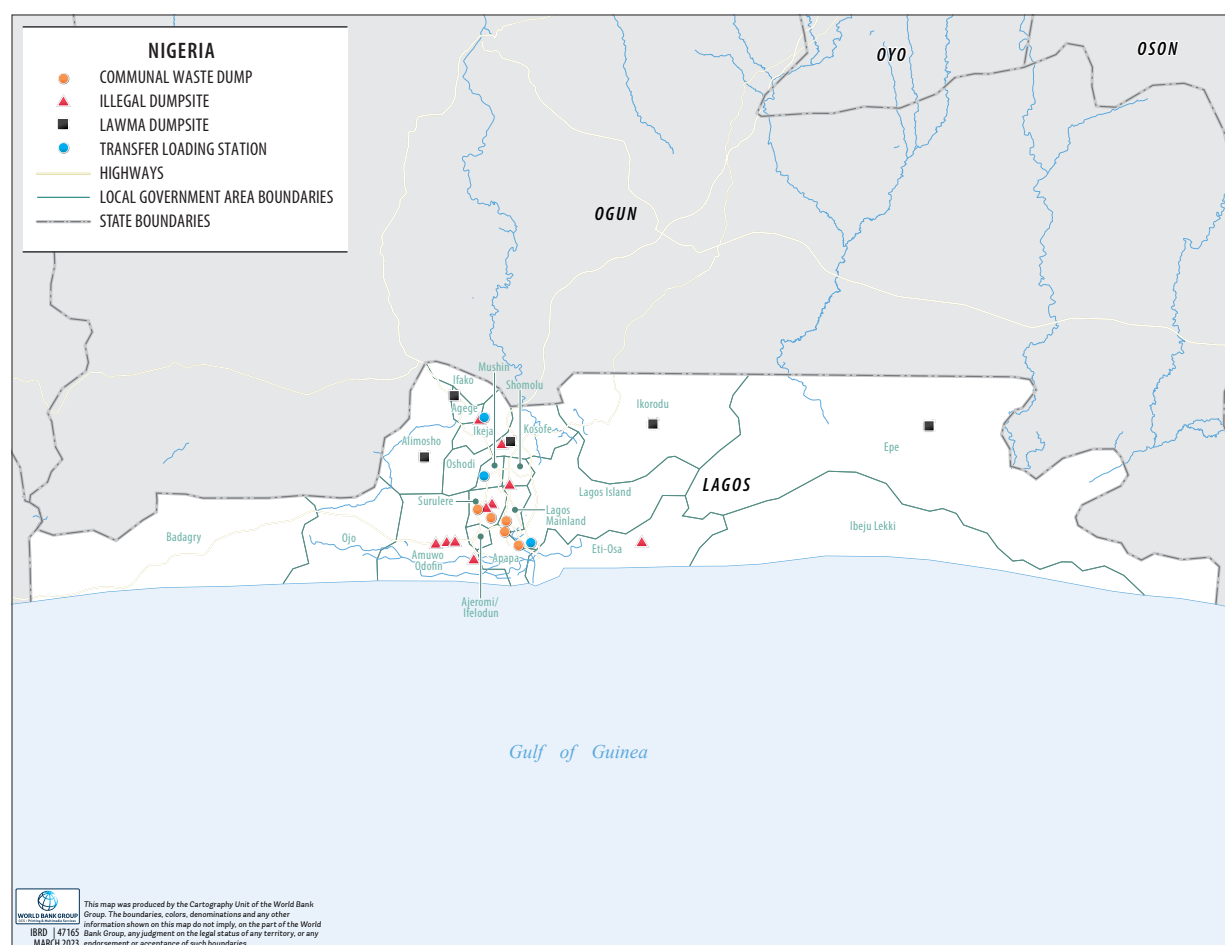
Where:

- E_i = Annual emissions of pollutant in year i
- W_b = Mass of waste burned
- EF_i = Emission factor for pollutant released.

The GHGs emitted from the open burning of waste are carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). The required data inputs are as follows: (1) Types and composition of waste openly burned; (2) Amount of waste openly burned; and (3) Dry matter content, total carbon content, fossil carbon content, and oxidation factor for the different types of waste (Guendehou et al. 2006).

Note: Review included the following studies: World Bank 2024e (internal report), Akpokodje et al. 2022, ARIA 2021, LAWMA 2021. Further information was obtained during a stakeholder engagement session with the Managing Director of LAWMA, Mr. Ibrahim Odumboni on the September 1, 2021; and further engagement with assigned LAWMA officers.

Map TS3.1 Waste facilities in Lagos State



Source: Lagos State Metropolitan Development and Governance Project. (LMDGP 2009). For more information, visit the World Bank website at <https://documents.worldbank.org/pt/publication/documents-reports/documentdetail/507901468288366259/nigeria-lagos-metropolitan-development-and-governance-project-lmdgp-procurement-plan>.

Note: LAWMA = Lagos Waste Management Authority, LGA = local government area.

TS3.2 KEY FINDINGS

This section summarizes the emissions estimates of $PM_{2.5}$, PM_{10} , and GHGs (CO_2 , CH_4 , and N_2O) from the following sources: (1) MSW deposited at dumpsites operated by Lagos Waste Management Authority (LAWMA); and (2) Open burning of waste in Lagos State, based on available data and methods. Emissions from disposal were calculated for the five LAWMA-operated dumpsites in the state and were also disaggregated based on the contribution from different waste types. Total emissions from dumpsites and open burning of waste produced an estimated 7,652,025.26 MTCO₂e 100-year GWP GHG emissions. Similarly, 5,434 MT of $PM_{2.5}$ and 8,310 MT of PM_{10} have been released.

TS3.2.1 Emissions from Dumpsites

The results reveal that 82,426 MT of methane (equivalent to 2.06 million MTCO₂e) was released from the estimated 2.565 million MT of MSW deposited at the five disposal sites in Lagos State in 2021. The annual PM_{2.5} and PM₁₀ emissions from these sites are estimated at 84 kg and 562 kg, respectively, as shown in table TS3.1. The distribution of emissions by disposal site shows that Olusosun contributes 61 percent of the total CH₄ emissions of all disposal sites in Lagos State and 54 percent of PM_{2.5} and PM₁₀ emissions. The lowest emissions are from the Epe site, contributing 7 percent of CH₄ emissions and 9 percent of total PM emissions.

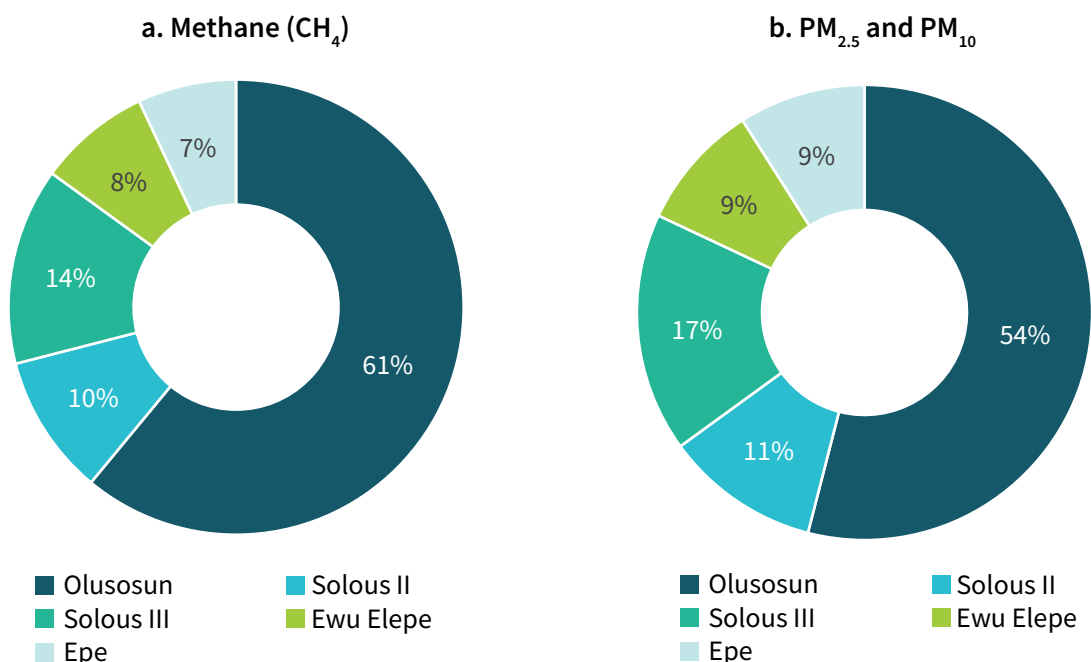
Table TS3.1 Estimates of CH₄, PM_{2.5}, and PM₁₀ emissions from MSW at five disposal sites in Lagos State, 2021

Dumpsite	Amount of waste deposited (TPY)	CH ₄ emissions (TPY)	PM _{2.5} emissions (kg per year)	PM ₁₀ emissions (kg per year)
Olusosun	1,376,804	50,601	45	302
Solous II	284,524	7,843	9	62
Solous III	424,189	11,267	14	93
Ewu Elepe	237,423	6,637	8	52
Epe	242,061	6,079	8	53
Total	2,565,000	82,426	84	562

Source: World Bank 2024e (internal report).

Note: CH₄ = methane, PM = particulate matter, TPY = tons per year.

Figure TS3.1 Distribution of emissions by disposal sites in Lagos State, 2021 (%)



Source: World Bank 2024e (internal report).

Note: PM = particulate matter.

Plastic waste, which makes up 29 percent of MSW in Lagos State, is the waste category that releases the highest amount of $PM_{2.5}$ and PM_{10} from the state's waste disposal sites, equivalent to about 24 kg of $PM_{2.5}$ and 162 kg of PM_{10} per year. Other significant contributors to $PM_{2.5}$ emissions are other inerts (20 kg per year) and food waste (15 kg per year). These waste categories also significantly contribute to PM_{10} emissions from dumpsites with plastics at 162 kg per year, other inerts at 132 kg per year, and food waste at 100 kg per year, as shown in table TS3.2. Figure TS3.2 shows the distribution of PM emissions from the various waste types deposited at the dumpsites.

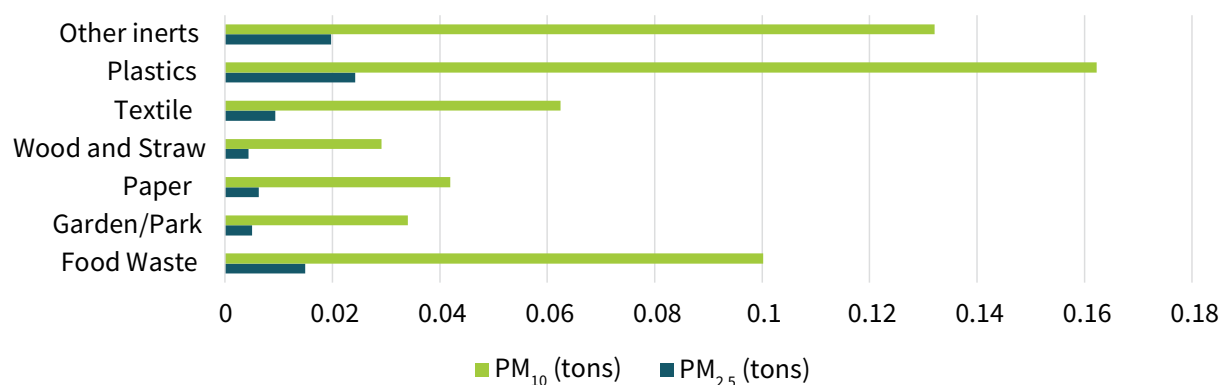
Table TS3.2 Distribution of PM emissions by waste type in Lagos State, 2021

Waste category	Percentage of total	$PM_{2.5}$ (kg per year)	PM_{10} (kg per year)
Food	17.83	15	100
Garden/Park	6.06	5	34
Paper	7.46	6	42
Wood and Straw	5.18	4	29
Textile	11.11	9	62
Plastics	28.87	24	162
Other inerts	23.5	20	132
Total	100.01	84	562

Source: World Bank 2024e (internal report).

Note: Percentage does not add up to 100 due to rounding errors. PM = particulate matter.

Figure TS3.2 Distribution of PM emissions by waste type in Lagos State, 2021



Source: World Bank 2024e (internal report).

Note: PM = particulate matter.

TS3.2.2 Emissions from Open Burning

Primary GHG emissions from open burning of MSW are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) and were calculated for this study. It was estimated that 14.7 percent (equivalent to 698,250 MT) of the total MSW generated in 2021 (2,565,000 MT) was openly burned in Lagos State.

Based on this calculation, over 5.45 million MT of CO₂ were released. Methane emissions from open burning total 4,539 MT per year and N₂O emissions 105 MT. Overall, open burning resulted in 5.6 MTCO₂-e using a 100-year GWP.

With regard to particulate emissions from open burning, total annual emissions of PM_{2.5} are estimated at 5,434 MT and PM₁₀ are 8,309 MT. Table TS3.3 provides a detailed analysis of the contribution of various waste types in Lagos State, assuming that waste composition at disposal sites is the same as the composition of waste only burned in the state.

Table TS3.3 Annual emissions of GHGs and PM from open burning by waste type in Lagos State, 2021 (MT)

Waste Category	CO ₂	CH ₄	N ₂ O	CO ₂ -equivalent	PM _{2.5}	PM ₁₀
Food Waste	971,146	809	19	996,942	969	1,482
Garden/Park	330,070	275	6	338,837	329	504
Paper	406,323	339	8	417,116	405	620
Wood & Straw	282,139	235	5	289,633	281	430
Textile	604,583	504	12	620,642	603	922
Plastics	1,572,461	1,310	30	1,614,229	1,569	2,399
Other Inerts	1,279,973	1,067	25	1,313,972	1,277	1,953
Total	5,446,694	4,539	105	5,591,371	5,434	8,309

Source: World Bank 2024e (internal report).

Note: CO₂ = carbon dioxide, CH₄ = methane, N₂O = nitrous oxide, PM = particulate matter.

TS3.2.3 Total Emissions from the Sector

The total emissions of GHGs released from dumpsite deposits and open burning of MSW in Lagos are estimated to be equivalent to 7.652 million MTCO₂e at 100-year GWP per year in 2021. Similarly, from these combined sources, 5,434 MT of PM_{2.5} and 8,310 MT of PM₁₀ per year have been released. The total emission estimates generated have been from only disposal of wastes. This process did not estimate emissions from the entire value chain of waste management in Lagos State. Estimating emissions from the entire value chain will provide more comprehensive understanding of the contribution of the sector to emissions of PM and greenhouse gases (GHGs). This will be useful in formulating specific policies and interventions to address emissions from the components of the waste management value chain.

TS3.3 PUBLIC HEALTH AND ECONOMIC COSTS OF EMISSIONS FROM THE MSW SECTOR

The public health and economic implications of the calculated PM and GHG emissions from the mismanagement of MSW, including plastics, in Lagos State can be derived from the projected costs of reducing air pollution from the Air Quality Management Planning for Lagos State report,

and the estimated global social cost of carbon (Akpokodje et al. 2022; Guendehou et al. 2006).³⁰

In the air quality management report, the public health impacts from 15,317 MT per year of PM_{2.5} emissions are estimated to cost \$3.83 billion. Therefore, the public health cost per MT of PM_{2.5} in Lagos State is estimated at \$250,244.83 (Akpokodje et al. 2022).³¹ Based on the study, the cost of reducing air pollution in the state to World Health Organization (WHO) standards from the PM_{2.5} emissions (that is, 5,434 MT) calculated in this study would be \$1.361 billion. Using the same proportion, the health costs of PM_{2.5} emissions from plastic waste in Lagos State (estimated at 1,569 MT) would cost \$392.6 million.

The economic costs of GHG emissions from MSW mismanagement have been derived based on two values of the social costs of carbon used in the Lagos PMEHS study (\$51) as the base and the most recent value (\$185) (Prest, Wingenroth, and Rennert 2022). Based on these values, the cost of 7.65 million MT of CO₂e emissions for 2021 ranges from \$390.30 million to \$1.42 billion. In addition, the economic cost of plastic waste mismanagement in the state, calculated for this PROBLUE study, ranges from \$80.2 million to \$290.9 million.

TS3.4 CHALLENGES

The key challenges to reduction of emissions of air pollutants and GHGs from the mismanagement of waste are linked to LAWMA's inadequate collection and disposal capacity, as well as a general lack of awareness and waste collection alternatives available to citizens. For instance:

1. LAWMA currently has attained about 50 percent waste collection rate across residential, commercial, and industrial locations. This is inadequate.
2. Inadequate facilities to segregate the waste types from source to make them suitable for landfilling, composting, recycling, and reuse.
3. LAWMA currently operates the existing landfills as dumpsites, which poses a challenge that often results in the emissions of air pollutants and GHGs from decomposition and occasional fires.
4. The inadequate rate of collection and facilities for waste segregation compels a high proportion of the population to illegally dump MSW and plastics at communal and illegal dumpsites within their homes or in the neighborhood. These wastes are often burned openly, thereby exposing the population to hazardous pollutants.

³⁰ The social cost of carbon is a global cost calculated based on population and economic growth, and global damages caused by one MT of CO₂ in terms of impacts on human health, agriculture, sea-level rise, and ocean acidity.

³¹ From the *Air Quality Management Planning in Lagos* report, the sectors that contributed the 15,317 MT of PM_{2.5} per year are the transport (road traffic, airport, seaport, and railway), energy, industry, agriculture, waste, cooking, and open burning sectors. The health cost of PM_{2.5} is based on the comprehensive analysis carried out by PMEHS study in Lagos State. This has been calculated based on what it would cost Lagos State to reduce air pollution to the WHO standards. However, a more detailed assessment of the health impacts can be derived from the age-stratified costs of mortality and morbidity. These details, however, are not available for this study.

TS3.5 RECOMMENDATIONS

This section outlines several recommendations to improve waste management practices in Lagos. Essentially, improving waste segregation, collection, and management practices would have a positive impact in the reduction of open burning; in turn, improving the air quality:

- **LAWMA to upgrade the operations at the five landfills to proper landfilling operations.** LAWMA should also establish additional landfills in Lagos.
- **LAWMA to increase engagement of the private sector participants (PSPs) to increase the rate of collection of MSW.**
- **Collection of MSW should facilitate the segregation of waste into the different components to support composting, recycling, and reuse.**
- **LAWMA to create awareness and engage communities within the areas currently underserved by it and the PSPs on the public health and environmental implications of illegal dumping and open burning of wastes.** The implementation of an action plan to collect waste and integrate waste segregation from source should follow the community awareness creation and engagements.
- **Reducing emissions of air pollutants and GHGs across the waste value chain, especially waste transportation, requires PSPs to set up low- or zero-emission facilities to collect and recycle waste within the communities they service.** The Garbage In Value Out (GIVO)-Warwick facilities provide a prototype that LAWMA and Lagos State Environmental Protection Agency (LASEPA) can adopt.
- **The relevant regulatory institutions should enforce the laws that prohibit illegal dumping and open burning of waste in Lagos.**

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TOPIC SHEET 4

QUANTIFICATION OF PLASTIC WASTE GENERATION IN HEALTHCARE FACILITIES IN LAGOS STATE

Further information on this topic is available at:
Improving Solid Waste and Plastics Management in Lagos State:
Assessing Plastic Waste from Healthcare Facilities (Internal report).

TS4.1 INTRODUCTION

Plastic waste management in healthcare facilities (HCFs) is a critical issue that requires attention due to the large amounts of plastic waste generated by these institutions. Plastic waste in the healthcare sector comes from a variety of sources, including medical equipment packaging, disposable medical supplies, and personal protective equipment. Improper handling, treatment, and disposal of this waste has negative impacts on public health as well as the environment.

The challenges and opportunities associated with plastic waste management in HCFs have been extensively documented in literature (Hounsell 2021; HPRC 2022; Huang et al. 2022; Rasheed and Walraven 2022). Globally, there is a shortage of safe waste management services for healthcare waste (HCW), especially in low-income countries. The most recent data from 2019 indicate that one out of every three HCFs globally does not manage HCW safely. The COVID-19 pandemic has led to significant increases in HCW, straining under-resourced HCFs and exacerbating the impact of this waste on the environment (WHO 2022).

The use of plastics in medical devices is continuously evolving, driven by advancements in polymer technology and changes in legislation and regulations. The global medical plastics market was valued at \$50.3 billion in 2022 and is expected to expand at a compound annual growth rate (CAGR) of 7.7 percent between 2023 and 2030 to reach \$90.1 billion by 2030 (Grand View Research 2023). Plastic waste is an ever-growing global challenge, second only to climate change in scope and impact. Unmanaged plastic waste can be found on every continent, from mountaintops to the seafloor. In addition to the plastic we can see, over time, the material breaks down into smaller and smaller pieces called microplastics. This way, plastic has worked its way into the food chain—from plankton to humans (Seay and Ternes 2022).

To tackle the complex issue of plastic HCW—and indeed, all plastic waste in general—requires a fundamental rethinking of the complex value chain and greater cooperation among all key players including producers, wholesalers, retailers, consumers, and recyclers. An assessment conducted for this report quantified the amount of plastic waste generated from selected health facilities in Lagos State to show the extent to which recycling medical plastic waste is viable from a business perspective. The methodology followed for the assessment is briefly described in box TS4.1.

BOX TS4.1 METHODOLOGY TO QUANTIFY PLASTIC WASTE FROM HEALTHCARE FACILITIES IN LAGOS STATE

This study used a quantitative observational approach to measure the amount of plastic waste produced by healthcare facilities (HCFs) in Lagos State. Structured observations to assess the daily volume of plastic waste generated were carried out on set days and recorded. The study used a probabilistic approach with a mix of stratified and multistage sampling.

Lagos State, with a population of over 24 million, has about 2,333 HCFs spanning 20 Local Government Areas (LGAs) (Nigeria FMOH 2019). The facilities are divided based on their scope of operations into primary, secondary, and tertiary public and private HCFs as shown in figure BTS4.1.1. Primary facilities include 1,574 facilities managed by the local government under the state's primary

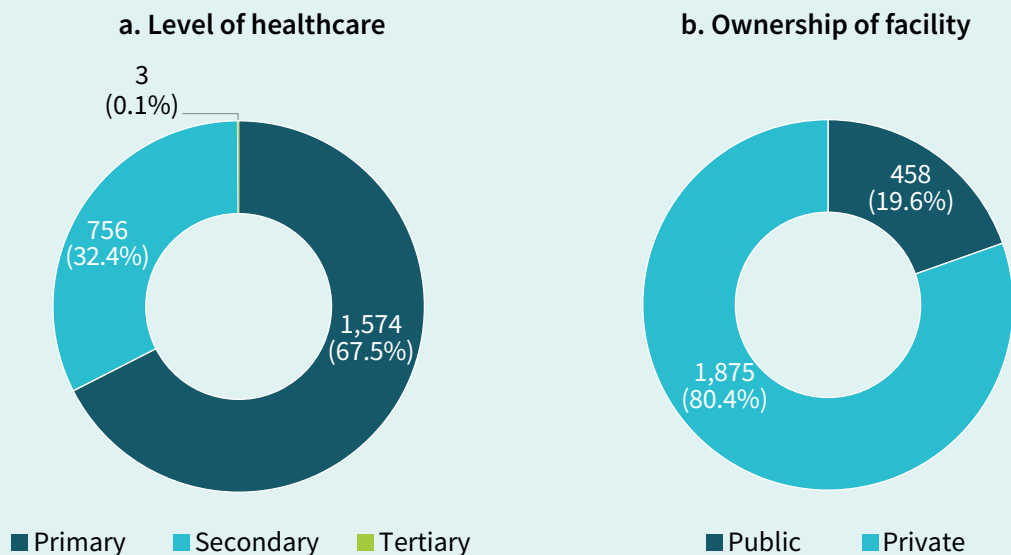
BOX TS4.1 METHODOLOGY TO QUANTIFY PLASTIC WASTE FROM HEALTHCARE FACILITIES IN LAGOS STATE (contd.)

healthcare development agency. There are 756 secondary facilities managed by the state Ministry of Health through the Hospitals Management Board. Finally, there are three tertiary facilities, one managed by the federal Ministry of Health's Department of Hospital Services, one managed by the state Ministry of Health, and one owned and managed by a private entity.

A total of 16 facilities were selected in the Lagos IBILE (Ikorodu, Badagry, Ikeja, Lagos Island, and Epe) administrative categorization. The principal criterion for determining the optimal sample size was saturation. A two-bag system was introduced to swiftly identify and collect data. Black bins were used for uncontaminated plastics, primarily from general administrative areas, wards, and on-site pharmacies, which generate most of the plastic waste. Red bins contained contaminated plastics from theaters, wards, and injection rooms. The assessment segregated uncontaminated (that is, recyclable) from contaminated (that is, recyclable but requires pretreatment, for example, sterilization) plastic waste and estimated the quantity of plastic HCW generated by these facilities in the state.

Field sampling was carried out on the days when the private waste collectors (managed by Lagos Waste Management Authority [LAWMA]) collect the waste. The waste was weighed before it was transported from the facilities by LAWMA. This ensured that we were able to capture and measure all the plastics collected at the facility that week. The waste was measured using digital scales, and the data were recorded in real time using Google Forms.

Figure BTS4.1.1 Types of healthcare facilities in Lagos State, 2023



Source: World Bank 2024f (internal report).

Note: HCF = healthcare facility.

TS4.2 KEY FINDINGS

Observations from the assessment show that HCFs in Lagos State generate various types of plastic, as shown in figure TS4.1.

Figure TS4.1 Types of uncontaminated and contaminated plastic medical waste generated in Lagos State

 Uncontaminated plastic medical waste	 Contaminated plastic medical waste
Plastic water bottles	Tubing
Plastic juice/soft drink containers	Intravenous tubes and sets
Disposable plates and cups	Catheter
Empty plastic drug containers	Used syringes
Disposable plastic cups	Used vacutainers
Plastic disinfectant containers	Plastic disinfectant containers
Plastic containers for alcohol	Plastic containers for alcohol
Biscuit wraps	Used drip bags
Water sachets	Urine bags
Empty eye-drop containers	

Source: World Bank.

The average daily amount of contaminated (red bins) and non-contaminated (black bins) plastics generated at the three types of facility is shown in table TS4.1. Across all facilities, non-contaminated plastic waste constitutes a higher percentage of waste generated. Secondary HCFs generate a significantly higher quantity of both types of plastic waste compared to tertiary and primary facilities. Due to the low rates of waste generated in primary facilities, waste collection by LAWMA normally occurs once a week. On the other hand, for larger secondary and tertiary facilities that generate higher volumes of plastic waste, visits do occur daily in some cases.

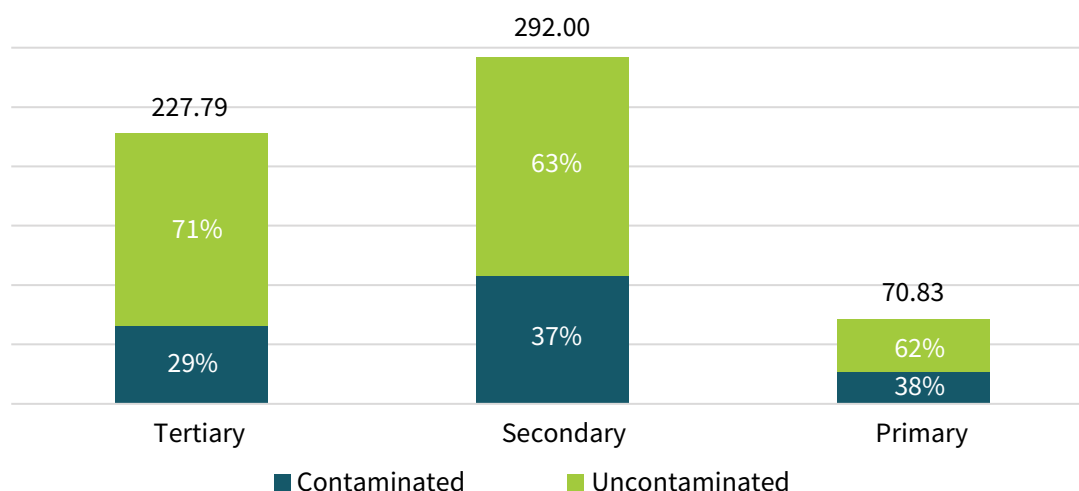
Table TS4.1 Weight of plastic waste collected from HCW facilities in Lagos State (kg)

Facility Type	Number	Cumulative Weight of Waste (14 Days)			Average (Black Bins/ Day)	Average (Red Bins/ Day)	Average (Total/ Day)	Share of plastic waste (%)
		Black Bins	Red Bins	Total				
Tertiary	1	2,263.00	926.00	3,189.00	161.64	66.14	227.79	49
Secondary	6	2,564.00	1,524.00	4,088.00	183.14	108.86	292.00	39
Primary	9	619.00	372.55	991.55	44.21	26.61	70.83	12
				8,268.55	389.00	201.61	590.61	

Source: World Bank 2024f (internal report).

The table above shows that even though the tertiary facility generates more plastic waste, cumulatively, the secondary health facilities emerged as the highest contributor to plastic medical waste in Lagos State. On average, the secondary health facilities, at 292 kg per day, generate significantly higher plastic waste daily. This is followed by the tertiary facilities, with the primary facilities coming a distant third. Figure TS4.2 shows a graphical representation of the average daily weight of contaminated and uncontaminated plastic waste from sampled HCFs.

Figure TS4.2 Average daily weight of plastic waste from sampled healthcare facilities (kg)



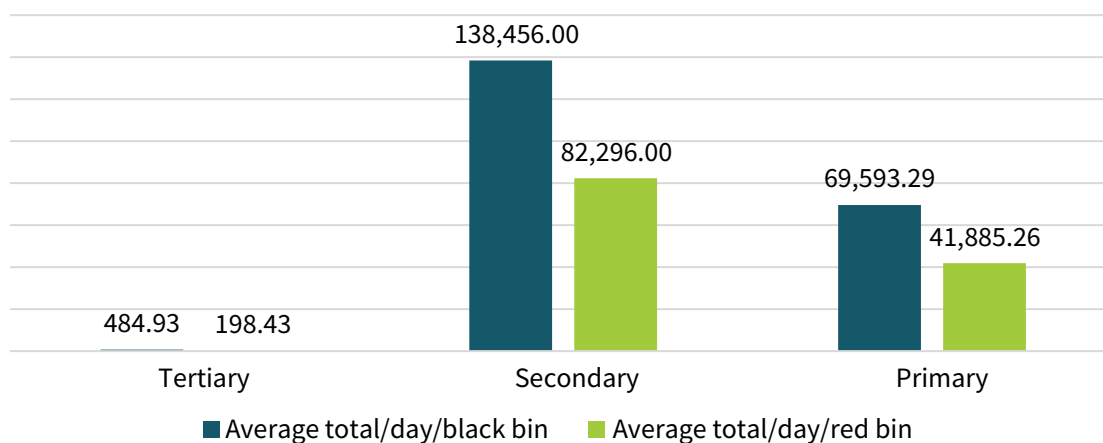
Source: World Bank 2024f (internal report).

To determine the total quantity of plastics generated across all HCFs in Lagos State, an estimation was made for all HCFs in Lagos State by multiplying the average weight per level of facility by the total number of the facilities (primary, secondary, or tertiary).

Figure TS4.3 shows the estimated daily weight of plastic waste generated from all HCFs across Lagos State. It lays credence to the assumption that medical facilities across the world generate huge volumes of plastic waste. The data also align with the massive population of Lagos State and affirm the claim that Lagos is a mega city in terms of population. Estimation indicates that tertiary facilities generate a total of 683.36 kg of contaminated and non-contaminated plastic waste per day;

the secondary facilities, a total of 220,752 kg of contaminated and non-contaminated waste per day; and the primary facilities, a total of 111,478.91 kg of the same category of waste in a day. Further checks show that Lagos State generates 208,534.21 kg of non-contaminated waste and 124,379.69 kg of contaminated waste daily.

Figure TS4.3 Estimated weight of plastic waste from all healthcare facilities in Lagos State (kg)



Source: World Bank 2024f (internal report).

TS4.3 CHALLENGES

Based on the analysis for this study, the challenges in managing HCW in Lagos State are summarized as follows:

- In all the HCFs visited, plastic waste is commingled with the noninfectious and potentially infectious wastes without segregation, making it difficult to easily sort the plastic wastes for recycling.
- Health facilities do not weigh their plastic waste, and no records are kept of the quantity of plastic waste being generated from each health facility to determine its viability.
- Where waste segregation occurs, the segregated waste is collected and disposed of in the same dumpsite.
- There is a significant gap in data gathering across the waste management industry, evidenced in the paucity of data on waste collection at HCFs in Lagos State.
- There is a significant knowledge gap among health workers and regulatory agencies in the management of plastic waste from HCFs.

TS4.4 RECOMMENDATIONS

Recommendations on improving HCW in Lagos State include the following:

- **The government should implement regulations to promote segregation and categorization of medical plastics at source.** Plastics in HCFs that are not contaminated with body fluid should be separated, treated, and disposed of in a separate manner from those that are contaminated with body fluids. Only those contaminated with body fluid should be sent to high temperature incinerators at various locations in the state if there is no means to sterilize them.
- **Deliberate effort should be made by the government and its agencies to monitor and enforce data repository at HCFs and other points of waste generation.**
- **Whereby recycling is chosen as an option for treatment or disposal of the plastic waste from HCFs, there should be a link of the recycling organizations and the health sector to promote sourcing of recyclable materials from the HCFs.**
- **Capacity building for health workers and regulatory agencies on plastic waste management and the potential of circular economy for plastic waste from health facilities.**
- **HCFs should sign agreements with the pharmaceutical companies through the extended producer responsibility (EPR) act to retrieve all plastic packaging generated as waste from their pharmaceutical products.**
- **An in-depth business model should be developed that will showcase the viability of medical waste recycling, considering the total volume of plastic waste generated in Lagos State and the cost of recycling such waste.** This will facilitate an economically viable solution for recycling medical plastics.
- **The government needs to take necessary steps to promote the increased use of recycled plastics in health facilities and other industries in Lagos State.**

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TOPIC SHEET 5

WASTE CHARACTERIZATION STUDY AT OLUSOSUN DUMPSITE

Further information on this topic is available at:
*Improving Solid Waste and Plastics Management in Lagos State: Waste
Characterization Study at Olusosun Dumpsite in Lagos* (Internal report).

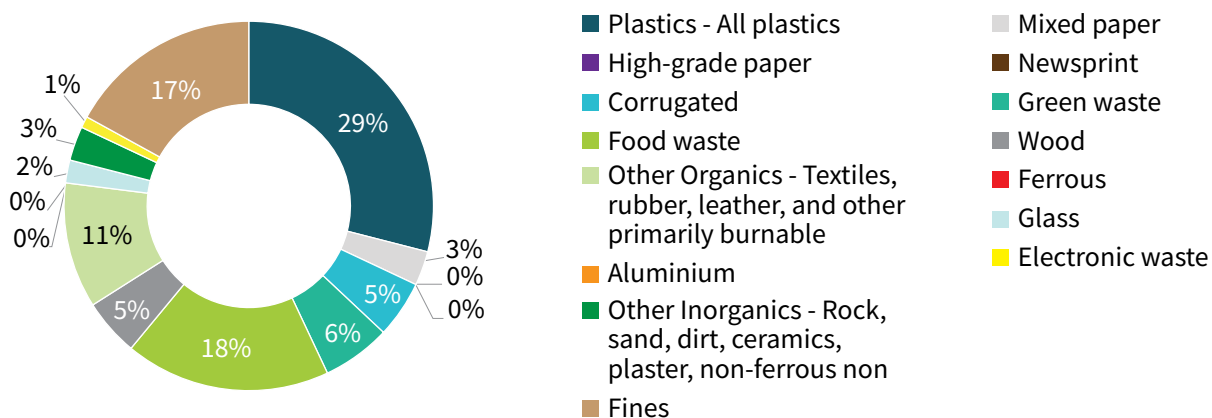
The city of Lagos, the most populous in Africa, is assumed to generate over 13,000 tons of waste per day (TPD), while only approximately 33 percent is collected. According to the Lagos Statistics Bureau, the collection was 1.5 million metric tons (MT) in 2020, that is, 4,263 TPD (Lagos Bureau of Statistics 2020). Despite efforts by waste collectors and recyclers, plastic waste continues to find its way into drainage channels and water bodies, creating obstructions that increase flooding risks; damaging aquatic habitats; and negatively affecting eco-tourism, fisheries, and other sectors of the blue economy. Mindful of these challenges, the Federal Government of Nigeria and the Lagos State Government are working to improve solid waste management (SWM) practices through policy and regulatory reforms.

A comprehensive compositional analysis of municipal solid waste (MSW) generated in Lagos city was conducted in 2021–22 as part of the PROBLUE study. This study took place at the Olusosun dumpsite, the largest waste disposal site in the city, which receives approximately 40 percent of all MSW generated. The study used the ASTM standards and analyzed 384 samples based on 15 waste categories, considering wet and dry seasons.³² The samples were collected from a variety of sources, including low-, medium-, and high-income residential areas as well as industrial, commercial, and institutional areas.

TS5.1 PLASTIC AS A PROPORTION OF ALL WASTE

The most prevalent form of MSW at the dumpsite was plastic, accounting for 29 percent, as shown in figure TS5.1. Organic waste (consisting of food, wood, and green waste) made up only 29 percent of the total. It is important to note that the actual quantity of plastic waste generated can be significantly higher as a fraction of total MSW since not all collected waste reaches the dumpsites. On the other hand, plastic waste tends to be sorted with some dirt and humidity attached, making it heavier and increasing its relative weight in the final sum. In comparison, the average Lagosian generates 57 kg plastic waste per person per year, almost the triple of South Africans, at 19 kg per person per year. More studies are required to fully assess the amounts to plastic generated in Lagos State.

Figure TS5.1 Waste composition at Olusosun dumpsite



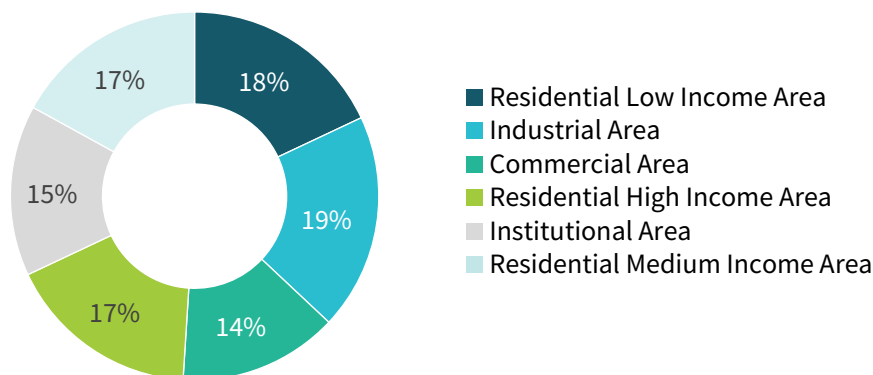
Source: World Bank 2024g (internal report).

³² ASTM International, formerly known as American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary consensus technical standards. ASTM's waste management standards provide the guides, practices, and test methods pertinent to the process of handling residential, commercial, and industrial wastes. For more information, visit their official website: <https://www.astm.org/products-services/standards-and-publications/standards/waste-management-standards.html>

TS5.2 PLASTIC WASTE BY SOURCE

Figure TS5.2 displays plastic waste distribution by source (for both wet and dry seasons combined). The findings suggest that, considering each source individually, the major contributor of plastic waste are industrial areas, while commercial areas contribute the least. When residential areas are grouped, households become the largest source of plastic waste, accounting for 52 percent.

Figure TS5.2 Plastic waste by source



Source: World Bank 2024g (internal report).

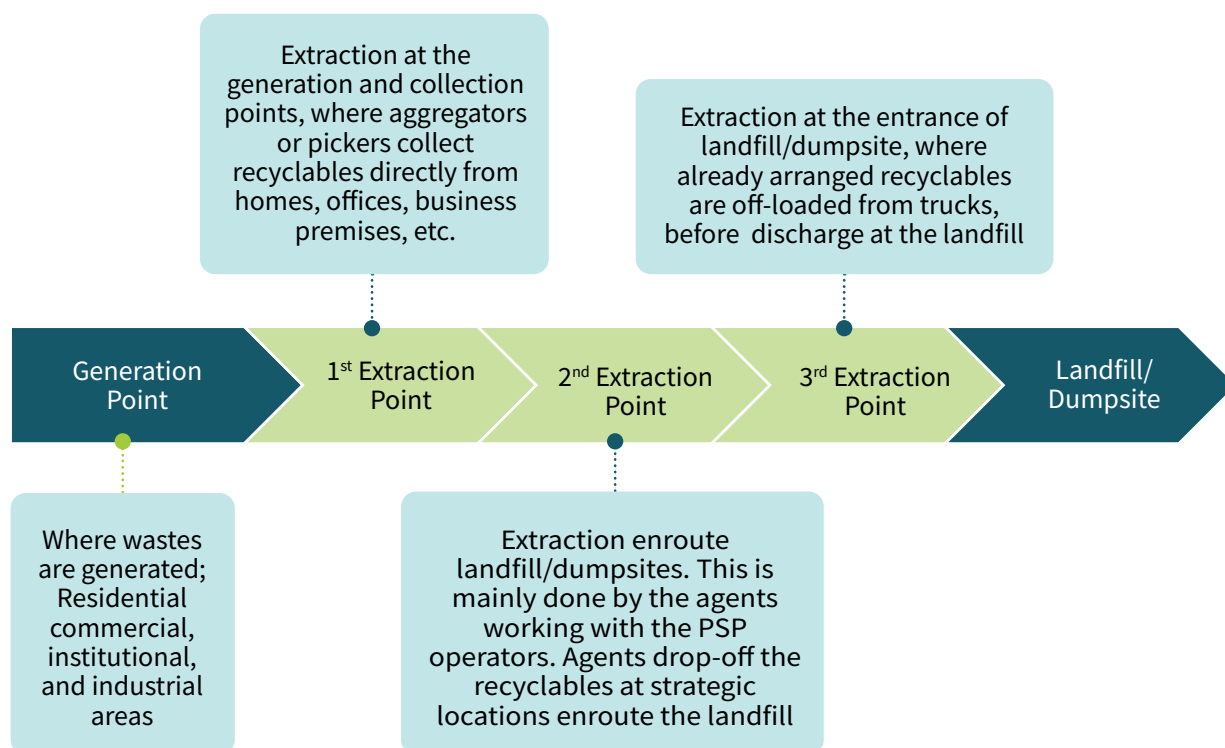
TS5.3 COMMON TYPES OF PLASTIC WASTE

An analysis of the various types of plastic waste revealed that plastic bags were the largest types of waste across all sectors, except for industrial areas where sachets were the leading type of plastic waste. Conversely, certain plastics such as polypropylene (PP), high density polyethylene (HDPE), and, particularly, polyethylene terephthalate (PET) were found in small quantities from all sources, suggesting that they were removed from the waste stream before reaching the dumpsite. This indicates that they are either separated at the source or collected by waste pickers from dumpsites due to their recyclable nature and resultant economic value.

TS5.4 PLASTICS EXTRACTED FROM THE WASTE STREAM

The study also examined the plastic collected by waste pickers at the dumpsite to sell to aggregators or recyclers. There are three primary extraction points, as shown in figure TS5.3, where high-value recyclables are taken out of the waste stream. Plastic bags represent the largest subcategory of plastics that reach the dumpsite, at 40 percent, highlighting its poor value for recycling. This is followed by other hard-to-recycle and low-value plastics such as sachets, polyvinyl chloride (PVC), low density polyethylene (LDPE), and polystyrene (PS).

Figure TS5.3 Three main extraction points for plastic waste at the dumpsite



Source: World Bank 2024g (internal report).

Assuming the waste composition for Lagos State, the amounts generated daily are in table TS5.1. A staggering 3,106 TPD of plastics are discarded daily or 1.3 million MT per year, equivalent to 57 kg per person. The organic and recyclables (paper, metals, and glass) fraction together constitute 66 percent of all waste.

Table TS5.1 Waste generated in Lagos

Waste composition	Weight (TPD)	Proportion (%)
Organic, green, and wood	3,779	29.07
Plastics (all types)	3,753	28.87
Recyclables (paper, metal, and glass)	902	6.94
Electronic and hazardous	95	0.73
Other types of waste	4,471	39.57
Total	13,000	100

Source: World Bank 2024g (internal report).

Note: TPD = tons per day.

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TOPIC SHEET 6

PLASTIC HOTSPOT ANALYSIS IN LAGOS STATE

Further information on this topic is available at:
Improving Solid Waste and Plastics Management in Lagos State:
An Analysis of the Solid Waste Sector (Internal report).

The amount of mismanaged plastic waste (MPW) and recurrent problems with plastic leakage into the natural environment suggest that collection efficiency is limited. An assessment of plastic waste leakage into water bodies and, ultimately, into the Atlantic Ocean, for this study estimates that the total amount of MPW ending up in the ocean varies between 7–13 tons per day (TPD) from Lagos State alone and 15–21 TPD from the Lagos Lagoon watershed. The Lagos Lagoon watershed includes two of the three largest cities in Nigeria (Lagos and Ibadan), covering an area of 56,171 km². Three main rivers—Yewa, Oshun, and Ogun—drain into the Lagos Lagoon. Without improvements to the municipal solid waste (MSW) system, levels of MPW will only be exacerbated over time, as shown in figure TS6.1.

Figure TS6.1 Estimated values for MSW, MPW ending up in waterways, and MPW ending up in the ocean, for Lagos State and Lagos Lagoon watershed (2022 and 2030)

 Solid waste generation		 MPW ending up in water		 MPW ending in the ocean	
Lagos State		From Lagos State		From Lagos State	
3,585,906*	4,611,608*	37,983*	48,847*	7*	13**
6,900,190**	8,875,707**	73,088**	94,013**	TPD (2022)	TPD (2030)
TPY (2022)	TPY (2030)	TPY (2022)	TPY (2030)	From Lagos Lagoon watershed	
Lagos Lagoon watershed		Lagos Lagoon watershed		15*	21**
7,907,493*	9,877,041*	83,758*	104,619*	TPD (2022)	TPD (2030)
11,221,777**	14,141,140**	118,863**	149,786**		
TPY (2022)	TPY (2030)	TPY (2022)	TPY (2030)		

Source: * = Census 2006; ** = LBS 2006; World bank 2024d (internal report).

Note: MPW = mismanaged plastic waste, TPD = tons per day, TPY = tons per year.

The coastal lagoons of Lagos, close to large urban centers and without waste and sewage treatment systems, are affected by microplastic pollution, thus impairing the ability of the ecosystem to provide a habitat for the fish fauna. Microplastics are a fast-emerging group of contaminants in water, sediment, and aquatic fauna in Lagos. Water and sediment samples were collected from four locations in the Lagos Lagoon and a tributary. The abundance of microplastics ranged from 310–2,319 particles per kg in sediment to 139–303 particles per liter in water. More microplastics were detected in the fine-grained sediments of Makoko, where waste discarded directly into the water is prevalent. The most commonly used polymers, polypropylene (PP) and polyethylene (PE), were also the most detected ones. Box TS6.1 describes the challenge of plastic pollution in Lagos Lagoons.

BOX TS6.1 PLASTIC POLLUTION IN LAGOS LAGOONS

One consequence of the exponential increase in plastic production is the presence of plastics in the marine environment. Rivers are responsible for most of the plastic input into the oceans. The pollution caused by MPW in the Lagos Lagoon and the adjacent rivers is evident in Makoko. A community of largely stilt habitations is situated offshore and directly built into the lagoon. Movements between habitations and fishing activities (livelihood of a majority of inhabitants) are mainly done using paddle boats which serve as floating markets and service centers for residents. Waste (human, animal, and solid) is directly disposed of into the lagoon. In the water phase, the highest number of water-suspended fibers was counted in Liverpool (302 particles per cu. m) whereas Makoko only revealed 204 particles per cu. m.

Description of human activities at Liverpool: Liverpool is major embarkation and berthing site for water transport boats, a landing site for one of the biggest daily fish markets in Lagos, and a site of significant levels of sand dredging. It is also located close to the main Lagos port and sea lanes.

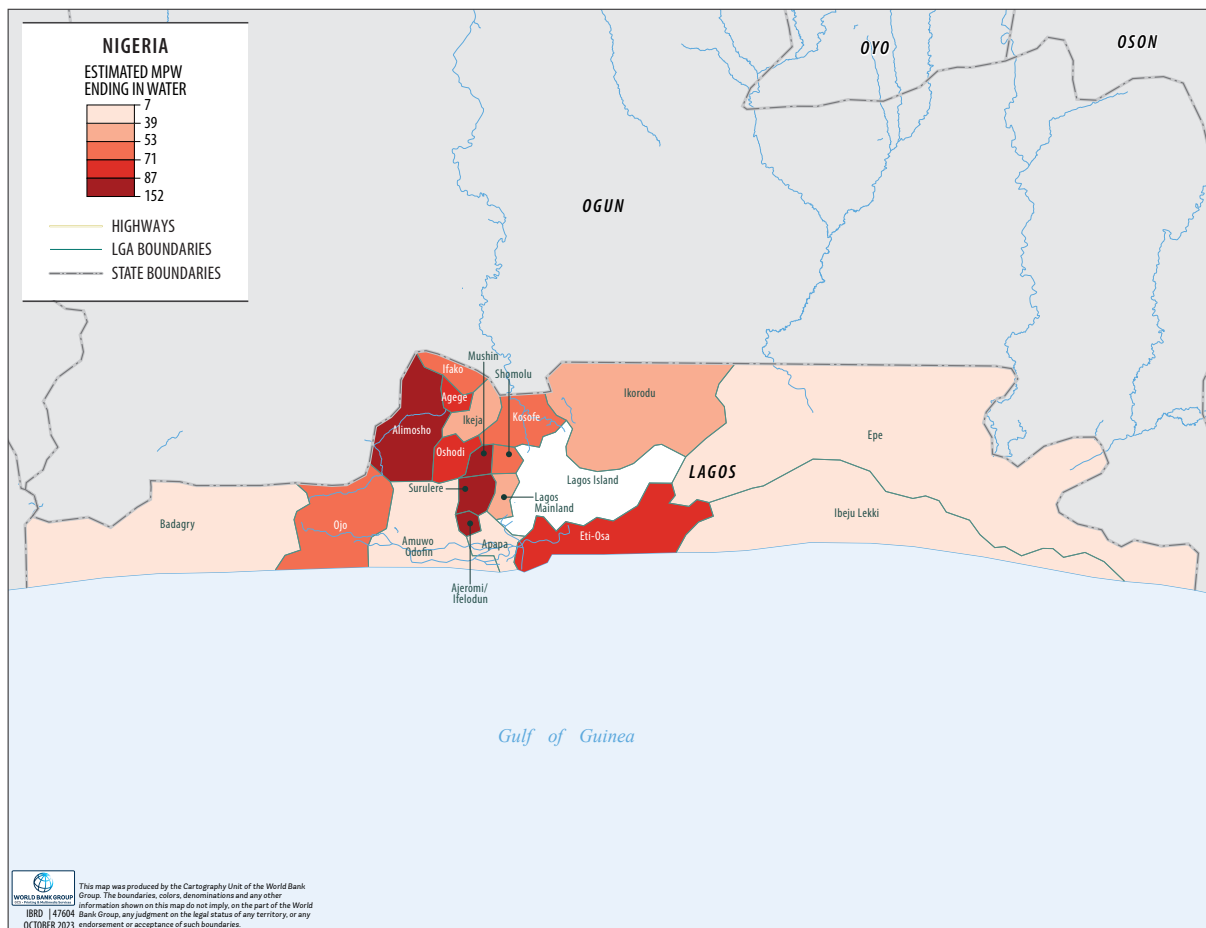
Seasonal high-water runoffs such as heavy rainfall events could help accentuate the situation. Plastic contamination of the water bodies in Makoko (2,319 particles per kg) is greater than in the three other sandy sites (310–410 particles per kg). This clearly shows that the high amount of plastic pollution is affecting communities that have no waste collection system and where plastic waste is discarded into the water. The most common polymers were PE and PP, as proven in many other studies.

As the Lagos Lagoon is connected to the Gulf of Guinea, one part of the plastic will most probably be transported into the final sink, the Atlantic Ocean. In the future, further studies will be needed to determine the exact concentrations, the increased sources of entry, and the possible effects of microplastics.

Source: Olarinmoye 2020.

The key challenges contributing to plastic waste leakage are as follows: (1) A lack of adequate and reliable data, such as the discrepancies in population data; (2) Partial coverage for waste collection services; (3) Variations in roles and responsibilities (for example, LAWMA sweeps only state-owned roads, while roads under local government area [LGA] management are neglected); and (4) Postponement of closure of the Olusosun dumpsite. The role of LGAs in solid waste management (SWM) is limited.

Map TS6.1 Estimated mismanaged plastic waste leakage into water bodies from Lagos State

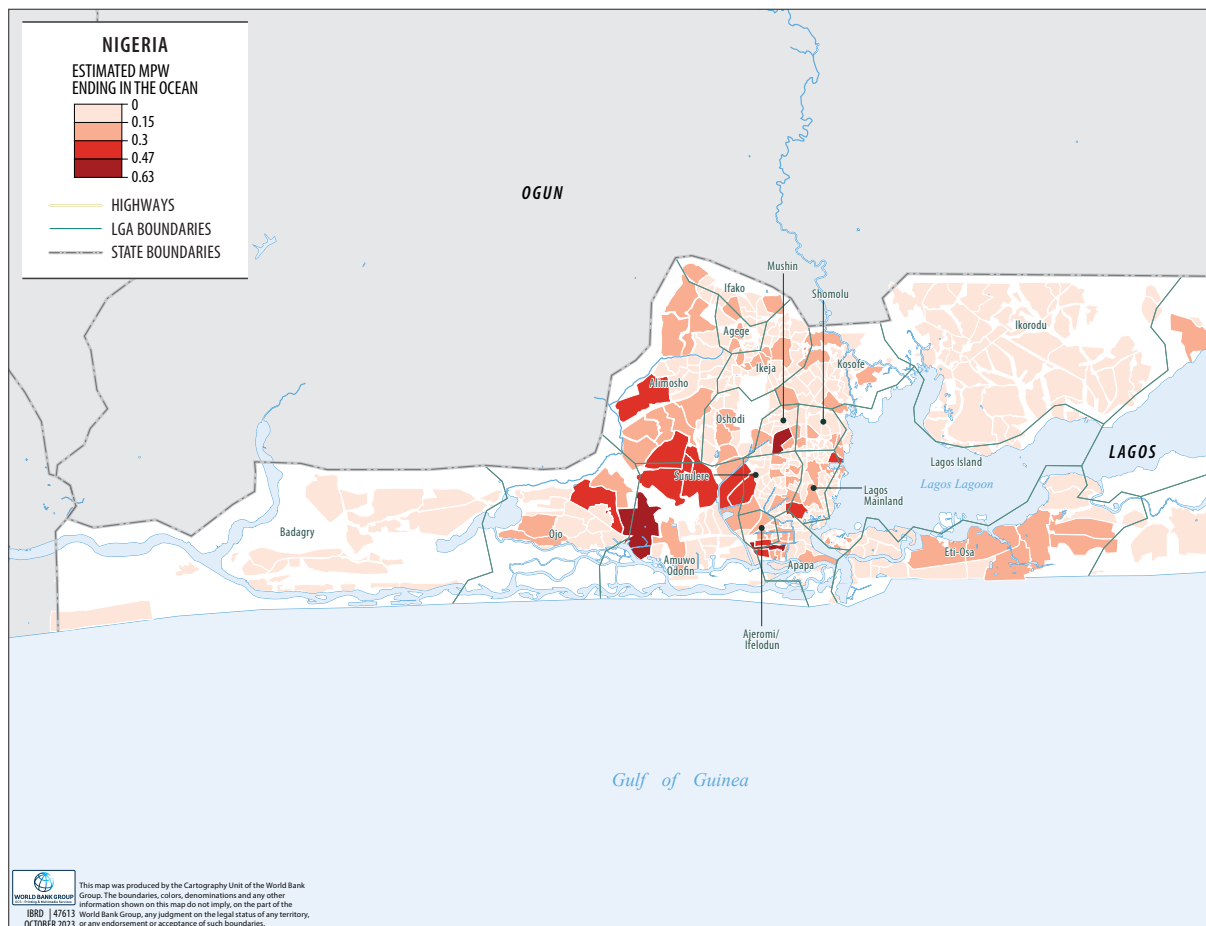


Source: World Bank 2024d (internal report).

Note: MPW = mismanaged plastic waste.

The informal shops and stalls erected around the streams and canals across the state directly pollute the drainage system with their daily waste. These informal sources fail to comply with the minimum distance requirements from water elements (10 m from canals and drainage, 15 m for rivers and creeks, 50 m for lagoons, and 150 m for the ocean). Many coastal communities in Nigeria have no official waste collection service and there is nowhere for litter to go. Regrettably, most of the waste generated in these communities ends up in the seas and oceans. A similar situation is verified in the Makoko slum, mostly built over water, that does not have access to waste collection in most of its area, and water is the destination of most of the solid waste. Map TS6.1 shows the estimated MPW leakage into water bodies from Lagos State.

Map TS6.2 Estimated mismanaged plastic waste emissions into the Atlantic Ocean from Lagos State



Source: World Bank 2024d (internal report).

Note: MPW = mismanaged plastic waste.

Nigeria faces increased precipitation episodes linked to climate change, with more frequent flood episodes affecting most of the Metropolitan Lagos area, even the main landfill at Olusosun that receives about 70 percent of the wastes collected in the Metropolitan Lagos area. Poor urban planning practices and inadequate environmental infrastructure exacerbate the problem, with little open soil available for adequate water infiltration, thus reducing potential water storage in the ground, with precipitation flowing directly over the ground to waterbodies and waterlines but also to the sewage system. This precipitation can rapidly accumulate in flatter areas, where stormwater and sewage systems are clogged with waste. Tourism is also a source of plastic waste, especially on the Atlantic coast in the east of Lagos Island. According to the Plastic Atlas Nigeria (HBF 2020), plastic waste is found on several beaches along the coastline—Alpha, Oniru, Eleko, and Lekki—as a result of tourist activities that are poorly managed and ultimately affect the health of marine species. Refer to map TS6.2 for estimated mismanaged plastic waste emissions into the Atlantic Ocean from Lagos State.

In some locations such as Alakija, Satellite town, and Amuso Odofin, residents mentioned that the frequency of private sector partnerships (PSPs) collection is scarce and irregular, with

open areas used for storage of waste until such a time that collection is made. This leads to the dispersal of debris by wind and stormwater. Respondents around Ayobo Ipaja noted that waste is often dumped on the road for LAWMA/PSPs to pick up. The same is reported for Ifako-Ojokoro and Ifako-Ijaiye. In Ibeju-Lekki, residents and commercial enterprises collect their wastes in containers for contractor to dispose of waste at designated dumpsites. Door-to-door collection by cart pushers is also adopted but not as effective, as the waste does not necessarily get to government-approved landfill.

Waste leakage to the environment is strongly related to the spatial distribution of the population, and subsequent spread into the environment is then regulated by natural flows (wind and water). The Lagos Lagoon collects water—and waste—from the larger area corresponding to its watershed. Location of waste dumpsites and spots of plastic waste accumulation in nature are still not identified systematically making it difficult to assess the real amount of waste leaked.

The reasons for waste leakage are related to waste not collected in due time, waste transported toward the waterlines and water bodies, and clogging water channels and in river and lagoon margins.

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A large pile of waste and scrap metal in a recycling facility. The pile contains various items including plastic containers, metal parts, and bags of scrap. In the background, there is a yellow wall with the text 'SHIPPING CO. DETERMINED' and a logo with the letters 'm' and 'SC'. The foreground features a large, stylized circular graphic with teal and white segments.

m
SC

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TOPIC SHEET 7

PLASTICS RECYCLING BUSINESS MODELS

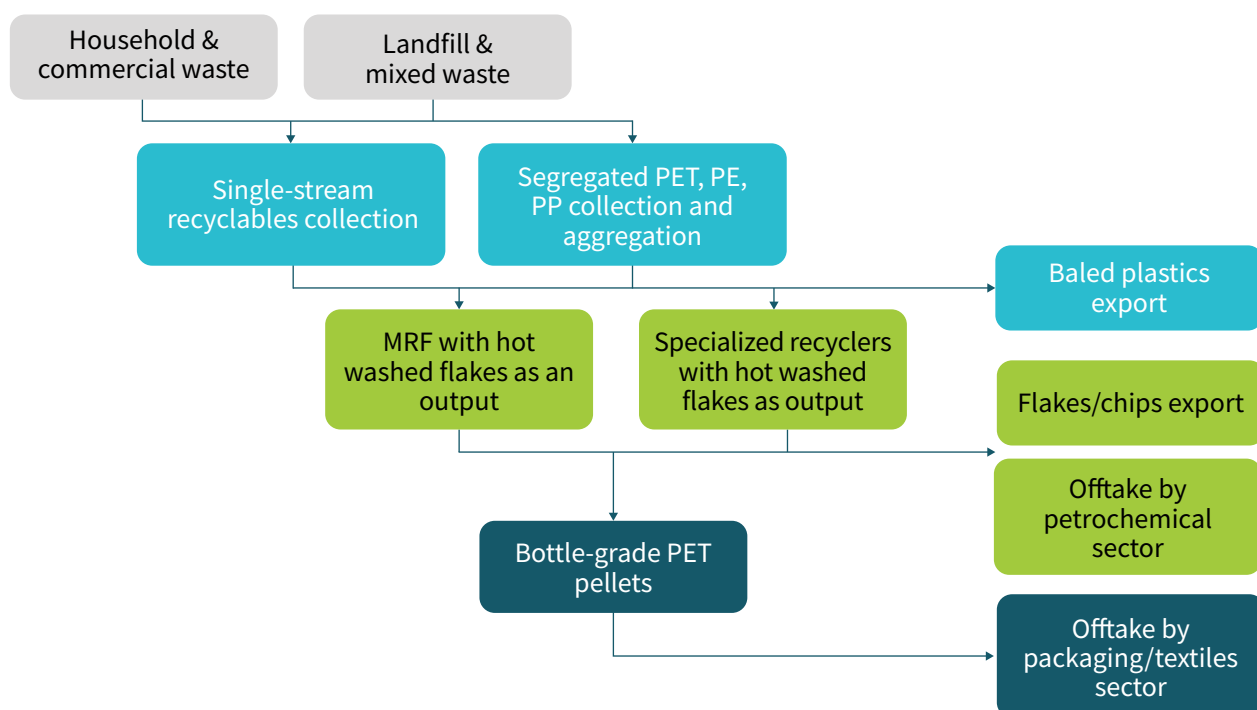


Plastics Recycling Business Models

For this analysis we assumed a facility with a capacity to produce 30,000 metric tons per year (MTPY) of combined recycled polyethylene terephthalate (PET), polyethylene (PE), and polypropylene (PP) in forms of hot-washed flakes or chips and then further to food-grade pellets. This is a commercial size facility and in line with recycling projects announced by the Lagos market players such as Engee, Omnik, and Alkem. We reviewed two collection (source separated and single stream collection of recyclables), two mechanical processing (mechanical plastics recycling facility and material recovery facility [MRF]), and one reprocessing (food-grade pallet production) options for their feasibility in Lagos, Nigeria.

For the reviewed options, available benchmarks for capital expenditure (CAPEX) and operating expenditure (OPEX) from the players in Nigeria, Africa, and other emerging markets were used to come up with the base cost and to conduct the cashflow analysis to assess the model option performance. The recycling pathways and the corresponding models (building blocks) are displayed in figure TS7.1.

Figure TS7.1 Plastics recycling pathways



Source: World Bank 2024h.

Note: MRF = material recovery facility, PE = polyethylene, PET = polyethylene terephthalate, PP = polypropylene.

Model 1: Source separated collection. Recyclable plastics are separated at the generation point (households and commercial entities) and picked up for delivery to collection centers for aggregation, sorting, and baling.

There are a variety of approaches to collection, aggregation, sorting, and baling of the source separated plastic waste to further channel it to a recycling facility, including but not limited

to direct sourcing from households and commercial entities (the Wecyclers model) as well as creation of collection centers (including community-based ones). Another emerging model can involve ‘reverse logistics’ of packaged goods (especially plastic bottles) sponsored by distributors that collect and take back the packaging. Notably, all models above are not mutually exclusive and are known to be successfully combined in practice and feed into one another. Refer to table TS7.1 for details on assumptions made and corresponding values of this model.

Table TS7.1 Assumptions for source segregated collection model

Assumptions*	Value	Assumptions	Value
Aggregation hubs (number)	10	CAPEX \$ per TPY (10 years equipment life)	530
Sourcing (%)			
• Direct from residents, commercial entities and individuals	40%	Total CAPEX requirement (\$)	4,000,000
• Community collection centers	40%		
• Reverse logistics	20%		
Collected volumes (kTPY)		Output (baled) price (\$ per MT)	
• PET	39	PET	220
• PE	45	PE	260
• PP	39	PP	260
Output - baled material (kTPY)		OPEX (\$ per MT)	
		Primary collection	35
		PET baling	145
		PE and PP baling	175

Note: CAPEX = capital expenditure, kTPY = kilotons per year, MT = metric tons, OPEX = operational expenditure, PE = polyethylene, PET = polyethylene terephthalate, PP = polypropylene, TPY = tons per year, * = There is limited local offtake of the ‘low-grade’ baled plastics. Therefore, the offtake pricing used to calculate the revenues is based on known reference Free On Board (FOB) price points for export destinations.

The model demonstrates marginally good results with an internal rate of return (IRR) of 7.61 percent per the base case and the payback period of eight years. However, at earnings before interest, taxes, depreciation, and amortization (EBITDA) margin of under 4 percent, the model is extremely vulnerable to changing macroeconomic conditions (both positive and negative). Slight reduction in offtake prices, which may be plausible due to the current volatility in the global commodity markets, shall render the model nonviable; the same applies to the possible increase in operating costs due to energy price or labor cost escalation, as an example. Potential mitigating factors include the addition of blended finance given the projects’ significant environmental, social, and climate benefits and the potential future additional financial contribution through the extended producer responsibility (EPR) schemes. If it translates directly into a ‘surplus’ offtake price, it will be able to significantly improve the project economics and make it much more resilient to other macro shocks.

Model 2: Single stream collection of mixed recyclables. Recyclable plastics are collected as part of a single stream recycling model where the waste is presorted at source into two fractions (recyclable and nonrecyclable) by the households, commercial, and industrial entities and then collected by the private sector partnerships (PSPs) to be delivered to an MRF. Refer to table TS7.2 for details on assumptions made, corresponding values and findings of this model.

Table TS7.2 Assumptions and findings for single stream recycling model ramp-up

Assumptions for single stream recycling model ramp-up	Value	Findings
PSP CAPEX for bins, trucks (\$ per MT)	65	- Under this scenario, the expected operational margin would be close to zero, prompting financial nonviability. - The single stream recyclables collection is nonviable for the PSP on current market terms as a stand-alone business unless incentives are introduced.
Total CAPEX requirement (\$)	39,975,000	
Equipment life, years	10	
Primary collection OPEX (\$ per MT)	25	

Note: CAPEX = capital expenditure, MT = metric tons, OPEX = operational expenditure, PSP = private sector partnership.

Model 3: Mechanical plastics recycling facility. Source separated and collected plastic recyclables (rigid PET, PE, and PP) are directed to a dedicated mechanical recycling facility designed to produce the following: (1) 30,000 TPY of hot-washed recycled polyethylene terephthalate (rPET) flakes suitable for food-grade applications; (2) 30,000 TPY of hot-washed rHDPE non-food-grade flakes; and (3) 30,000 TPY of PP non-food-grade flakes. Refer to table TS7.3 for details on assumptions made, corresponding values and findings of this model.

Table TS7.3 Assumptions and findings for mechanical plastics recycling facility model

Assumptions	Value	Findings
Total collected material (TPY)	103,826	The model is characterized by a sizeable operational margin of almost 40%, as well as the significant CAPEX requirement, resulting in the IRR of just under 20% and a 5-year payback period. This makes the project quite resilient to external shocks and price fluctuations.
Total output (TPY)	90,000	
CAPEX, equipment life 20 years (\$ per TPY)	600	
Total CAPEX requirement (\$)	62,295,652	
Sourcing price - PET (\$ per MT)	220	
Sourcing price - PE (\$ per MT)	260	
Sourcing price - PP (\$ per MT)	260	
Secondary sorting (\$ per MT)	85	
OPEX - Washing (\$ per MT)	60	
OPEX - Flaking/bagging (\$ per MT)	45	
Reference baseline offtake price (year)	2,022	
PET (\$ per MT)	850	
PP (\$ per MT)	650	
PE (\$ per MT)	650	

Note: CAPEX = capital expenditure, IRR = internal rate of return, OPEX = operational expenditure, PE = polyethylene, PET = polyethylene terephthalate, PP = polypropylene, MT = metric tons; TPY = tons per year.

Model 4: MRF model. Recyclables will be collected through the single stream recyclables collection model (including plastic, paper, and metal) and is channeled to an MRF, which sorts the recyclables. This model was

not further considered given the single-stream collection model was found nonviable (see Model 2 above).

Model 5: Food-grade rPET pellet production model. Assuming a 30,000 TPY food-grade rPET pellet manufacturing facility, using flakes from the mechanical plastics recycling facility (model 3 above), the operational margin in this model can be expected to be close to 20 percent, with the IRR of 26.38 percent and the payback period of under five years. Table TS7.4 provides details on assumptions, corresponding values, and findings of this model.

Table TS7.4 Assumptions and findings for food-grade rPET pellet production model

Assumptions	Value	Findings
Capacity (TPY) in output rPET flakes	30,000	The direct comparison with a scenario where pellets are priced on par with virgin material demonstrates that the project may become nonviable unless there are additional financial incentives (e.g., coming from an EPR scheme). If the project sponsor manages to secure a higher premium (resulting in an up to \$1,600 per MT price), the financial performance may improve significantly. If the EFSA and FDA certifications are obtained, rPET pellets could be sold in the EU or US for a higher price that could provide the upside needed to make it more financially attractive. The project is quite resilient toward the OPEX fluctuations; however, the volatility of the sourcing cost could reduce the operating margin to zero without the spread between rPET flakes (source) and food-grade rPET pellets (offtake) being maintained which is typically the case, although market could see some lags as described above.
CAPEX (\$ per TPY)	530	
CAPEX (aggregated, \$)	15,900,000	
Total CAPEX requirement (\$)	15,900,000	
Equipment life (years)	20	
Sourcing price - rPET flake (\$ per MT)	850	
Offtake price - food-grade rPET pellet (\$ per MT)	N/A	
OPEX (sorting/pelletizing) (\$ per MT)	25	
OPEX (extrusion/SSP) (\$ per MT)	45	
OPEX - Flaking/bagging (\$ per MT)	45	
Reference baseline offtake price (year)	2022	
PET (\$ per MT)	850	
PP (\$ per MT)	650	
PE (\$ per MT)	650	

Note: CAPEX = capital expenditure, EFSA = European Food Safety Authority, FDA = Food and Drug Administration, OPEX = operational expenditure, rPET = recycled PET, PP = polypropylene, SSP = Solid State Polymerization, TPY = tons per year, MT = metric tons, N/A = not available.

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World Bank. 2024h. *Improving Solid Waste and Plastics Management in Lagos State: Creating a Plastics Recycling Market in Lagos State*. Washington, DC: The World Bank.



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