

Nigeria Cement Industry Decarbonization

Manufacturing Insights Sharing Session

May 2024



This programme is funded by UK aid from the UK Government; however, the views expressed do not necessarily reflect the UK government's official policies

Context and Objectives

Context



- At COP26 in Glasgow at the end of 2021, Nigeria **committed to achieving Net Zero** by 2060
- Within the Energy Transition Plan, the **industry sector was calculated to represent about 16% of total in-scope emissions** in Nigeria as of 2020, **half of which were attributed to cement production**
- Leading companies in the Nigerian cement sector have commenced waste-to-energy initiatives to reduce their carbon footprint and there still **exists significant opportunities for scaling**
- Through assessment of a list of decarbonization levers adopted by cement manufacturers globally and based on our assessment, **waste-to-energy (alternative fuels) stands out as the most feasible lever** to implement in the immediate term in Nigeria
- We partnered with the Energy Transition Office as a technical partner in the **development of potential waste-to-energy decarbonization opportunities**, stakeholder engagement and dissemination of the output from this study

Objectives



Analyze the decarbonization and specifically, **waste-to-energy opportunity** including corresponding commercial value proposition to stimulate the required investments into decarbonization projects



Develop a decarbonization roadmap – one that can be replicated for similar heavy industry players in Nigeria e.g., steel, FMCG



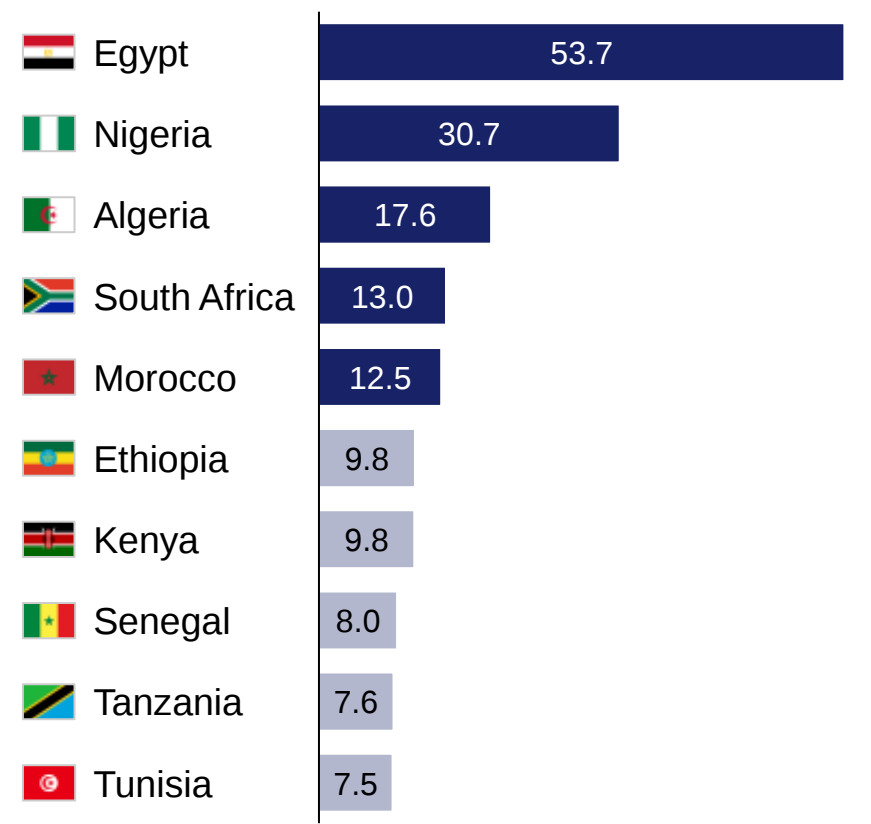
Develop a stakeholder (including investors) **outreach strategy** for dissemination of insights generated



Highlight potential TF transactions MA could support

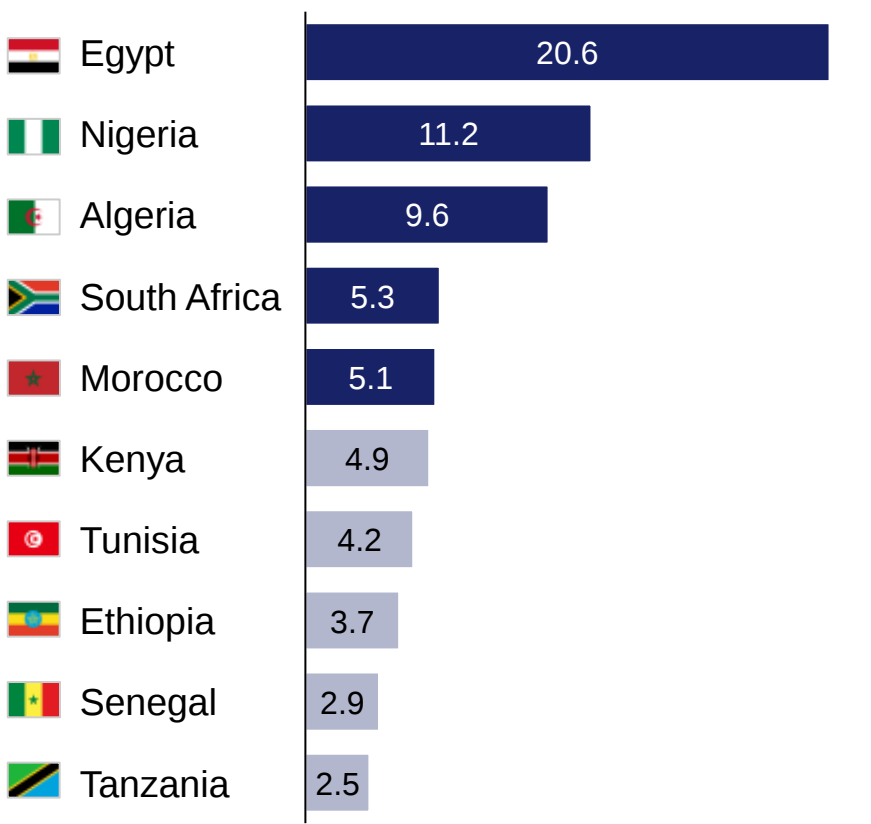
Nigeria is the 2nd highest cement producer and emitter in Africa

Top 10 cement producing countries in Africa, 2022, Million Mt



Top 5 countries in Africa account for 54% of production

Top 10 countries by CO₂ emissions from cement industry in Africa, 2022, Million Mt



Key Insights



There is a **direct correlation** between the amount of cement produced and CO₂ attributed to the cement industry of African countries

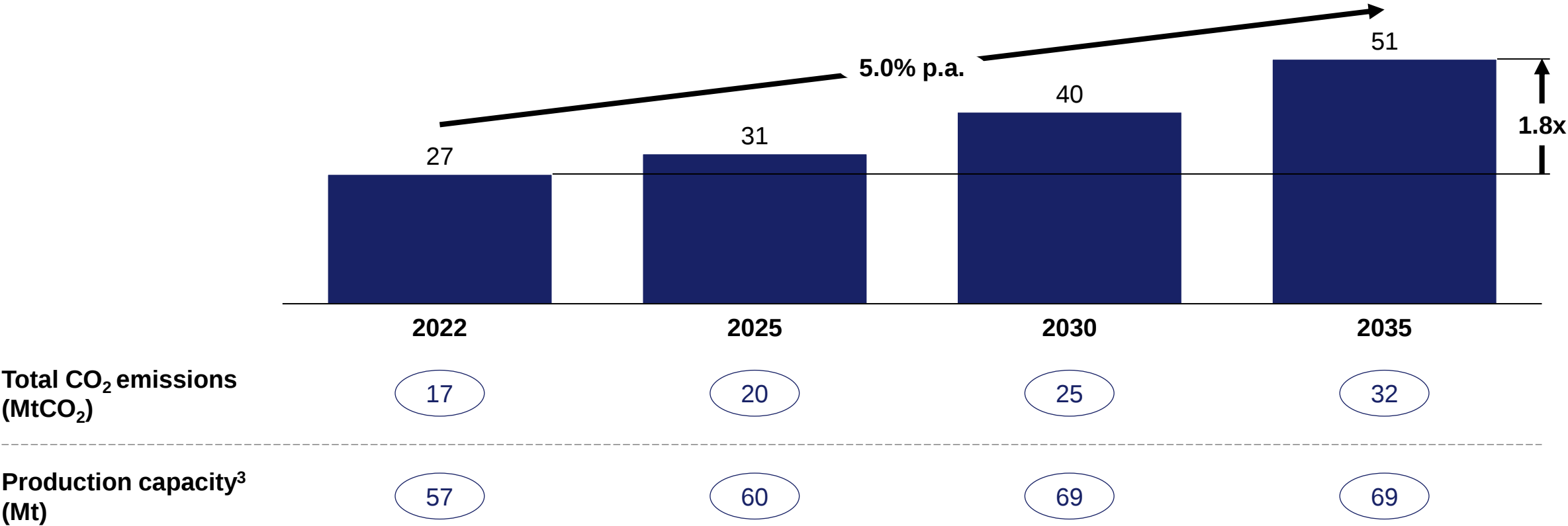
This could imply a level of **similarity in maturity of decarbonization efforts** within the cement production process **across African countries**

Cement production in Nigeria is projected to increase by ~1.8x by 2035, and CO₂ emissions from the sector could increase proportionally

Business as usual scenario¹

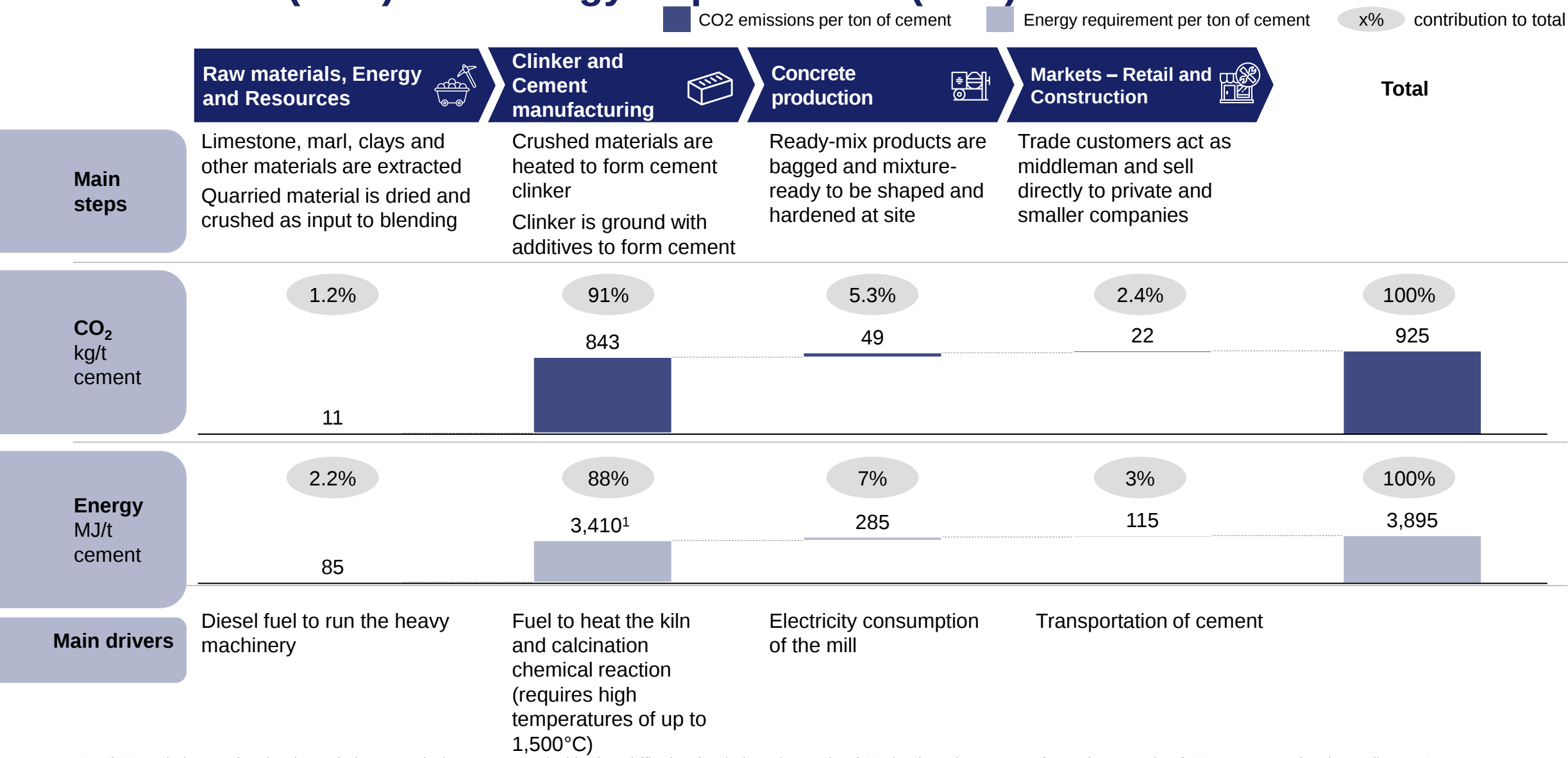
Cement production by top 3 players in Nigeria²

Mt, 2022 - 2035



1. This scenario assumes factors such as fuel mix, clinker to cement ratio and energy efficiency remain at 2022 levels
2. Annual growth rate of 5% applied, based on weighted average historical growth rate of Dangote, BUA and Lafarge sales
3. Based on public statements, Dangote expected to launch 6Mt plant in 2026 and BUA expected to launch 3Mt plants in 2025 and 2029

The clinker and cement manufacturing stage yields most of the CO2 emissions (91%) and energy requirements (88%) in the cement value chain



1. 42% of CO₂ emissions are from burning up fuel to create the heat energy required for the calcification chemical reaction. ~53kg of CO₂ is released per MMBtu of natural gas vs 91kg of CO₂ per MMBtu of coal according to US Energy Information Administration
Source: Expert interview

To reduce emissions, cement players generally employ decarbonization levers along three categories

NOT EXHAUSTIVE

■ Traditional levers
■ Innovation levers

A

Traditional production process-related levers

Alternative fuels

Many cement companies are investing in biomass and waste as an alternative source of fuel, focusing on the primary crop of the region as the most viable source of biomass fuel

Energy efficiency

Nearly all players use some form of energy efficiency measure, increasingly this entails the use of automation and robotics, AI (and machine learning), predictive maintenance and other digital tools

B

Material/product-related levers

Clinker substitutes

To commercialize greener concrete, produced using various clinker substitutes (e.g., calcined clays, limestone fillers)

Alternative binders

Industry players are using new types of binders (e.g., alkali-activated cements, flashed metakaolin), to produce low/net-zero concrete

C

New production process-related tech levers

Carbon capture

Industry players are investing in a variety of new technologies to capture CO₂ (e.g., liquid amine solvents scrub CO₂ out of flue gas)

Carbon looping

Pilot demonstrating calcium looping process in Italian plant (CLEANKER initiative). Flue gas is looped continuously through the calciner and a carbonator to enrich CO₂ percentage

Solar

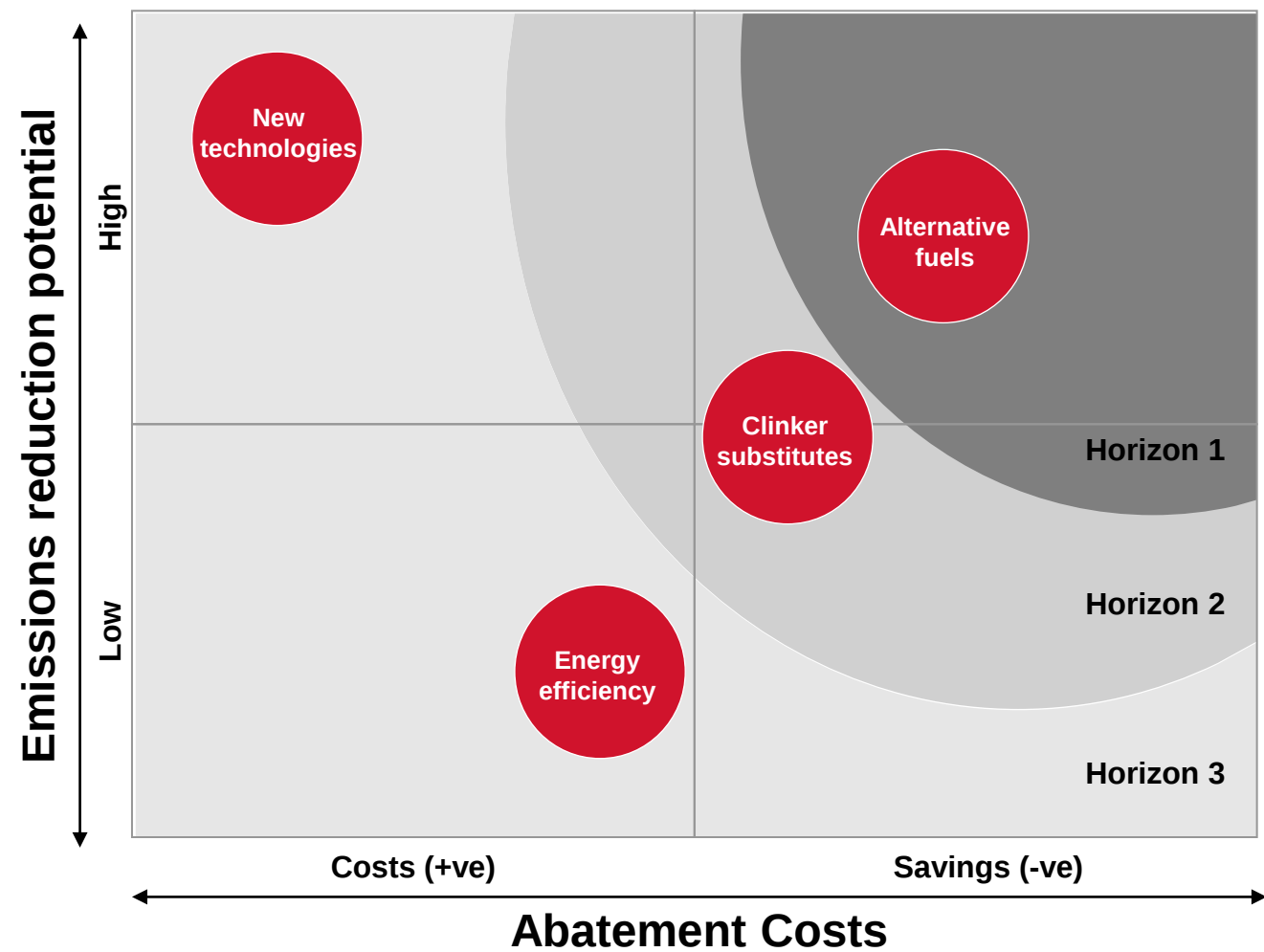
New AI-backed technology is managing to produce cement based on solar energy (using an array of mirrors)

Electrification of kiln and compressor

Electrification of the kiln and compressor, eliminating the need for burning fossil fuels. Successful pilot conducted, with cost estimated at 10-20 EUR/tCO₂ (can address only 30% of total CO₂)

Alternative fuels are the most feasible lever in the short term based on emissions reduction potential and abatement costs

PRELIMINARY – BASED ON BASE CASE

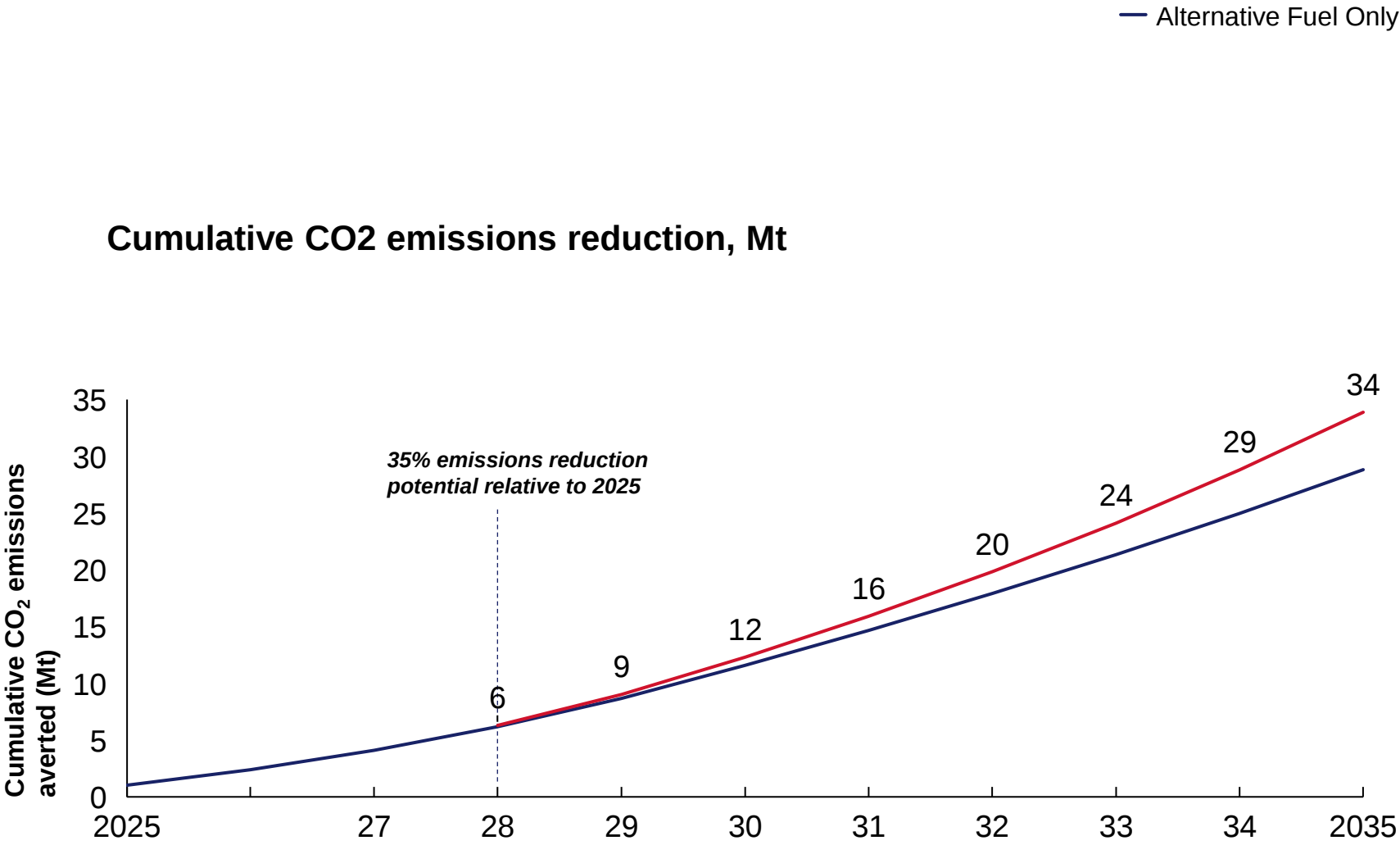


	% CO ₂ emissions reduction vs BAU ¹	Maximum abatement cost \$/tCO ₂
Horizon 1 (<3 years)		
Alternative fuels	25%	-35
Horizon 2 (3-10 years)		
Clinker substitutes	16%	-35
Horizon 3 (10+ years)		
New technologies	50+%	+115

Energy efficiency	12%	+25

1. Based on base case in emissions reduction model

Alternative fuels are the focus for the short term, presenting up to 35% emissions reduction potential



- In the **short term** (i.e., over 3 years), **increasing alternative fuel adoption to 30%**, could result in 6.3Mt of emissions averted and equivalent to 35% emissions reduction potential relative to 2025
- In the **medium term**, if **ONLY alternative fuels** is adopted, and alternative fuel adoption is increased to 50%, **this could result in 28Mt of emissions averted by 2035**
- In the **medium term** if **BOTH clinker to cement** ratio is reduced from 75% to 70% and **alternative fuel adoption** is increased to 50%, **this could result in 34Mt of emissions averted by 2035**

Overview of different feedstock used as alternative fuels

Feedstock	Description
Agricultural waste	Waste from production of crops such as rice husk, palm kernel shell, bagasse, coffee husk, cotton stalks etc. Also involves other waste from agro-industries such as chicken litter, glycerin from biofuel production
Municipal solid waste	Municipal solid waste is the waste produced by residents at home, in offices, or in commercial activities. This waste could include commercial waste, non-hazardous produced by industries, green waste, and street cleaning waste
Used tyres	Used tyres originate from the production of tyres and the replacement of tyres from vehicles such as cars, trucks, and buses. Other rubber waste originates from conveyor belts, shoe production, and many other sources.
Plastic waste	Plastic waste is mainly composed of plastic bottles but also includes others such as plastic bags
Saw dust	Sawdust (or wood dust) is a by-product or waste product of woodworking operations such as sawing, sanding, milling and routing
Mixed industrial waste	Industrial waste is the waste produced by industrial activity which includes any material that is rendered useless during a manufacturing process such as that of factories, mills, and mining operations
Animal meal	Animal meal is produced in rendering plants, and also from treating of waste materials associated with cattle slaughterhouses and meat production operations
Waste oil	Waste oil originates from any engine that requires lubrication (for example, car, truck, bus, mining machine/ truck, diesel locomotive, power generator, lawn maintenance equipment).
Sewage sludge	Sewage sludge is produced by sewage plants that receive municipal or industrial wastewater. The wastewater is cleaned using biological treatment, and the pollution is concentrated in the sludge.
Solvents	The hazardous solvents available in the waste market originate from chemical and pharmaceutical processes, manufacturing of paint and other building materials, as well as the use of paint in the automotive industry, furniture production

Agricultural waste and municipal solid waste were prioritized due to their suitability to the Nigerian cement industry

PRELIMINARY

Suitability to Nigerian cement industry   Focus of further analysis

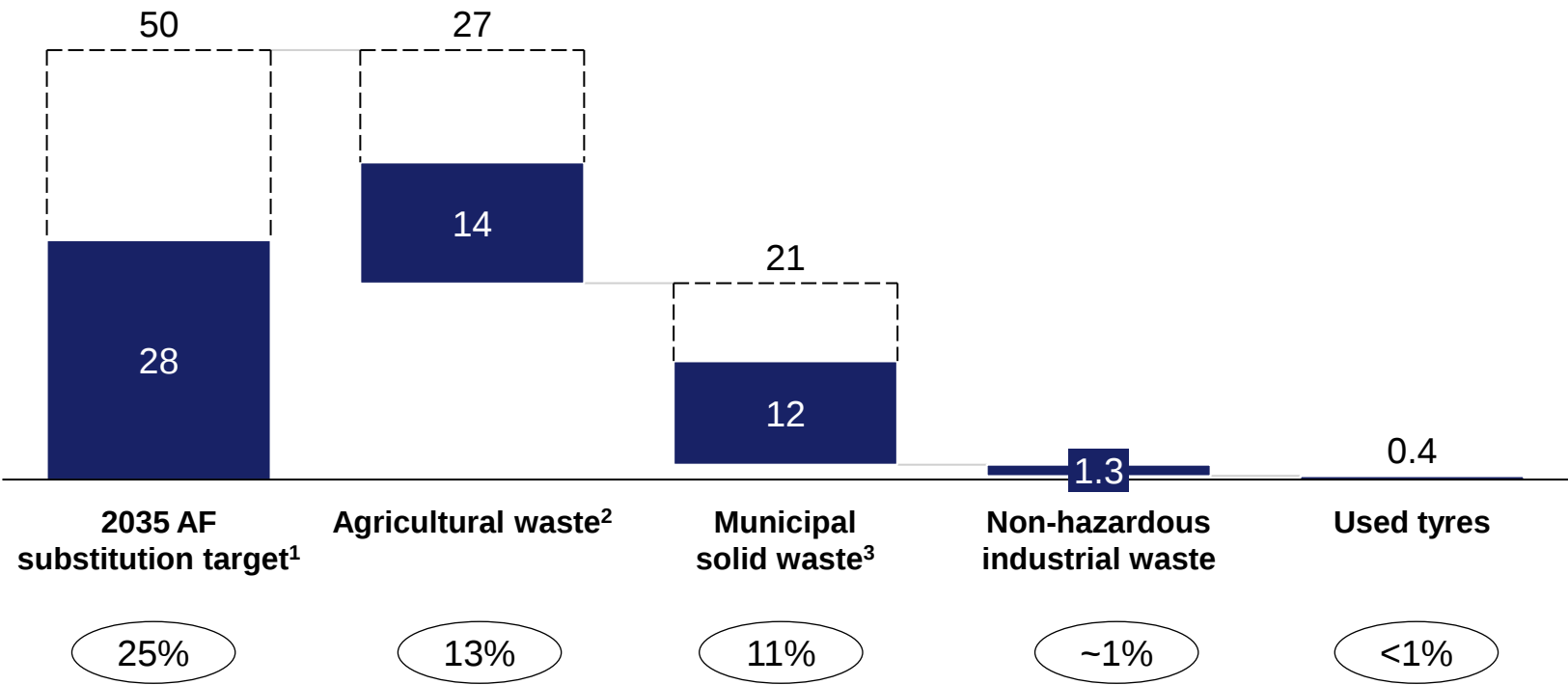
	1 Logistics		2 Affordability		3 Emissions reduction		4 Technical suitability	5 Clinker quality	Overall assessment
	Feedstock availability	Supply chain management	Capex affordability	Opex affordability	CO ₂ savings	Non-CO ₂ savings			
Agricultural waste									
Municipal solid waste									
Used tyres									
Mixed industrial waste									
Plastic waste									
Saw dust									
Waste oil									
Animal meal									
Sewage sludge									
Solvents									

Agricultural waste and municipal solid waste could jointly account for ~30 - 50% of the Nigerian cement industry's fuel mix by 2035

PRELIMINARY BASED ON ESTIMATES

(x) Potential % CO₂ emissions reduction ■ Base case □ Accelerated case

Potential distribution of alternative fuel use in Nigerian cement industry by 2035



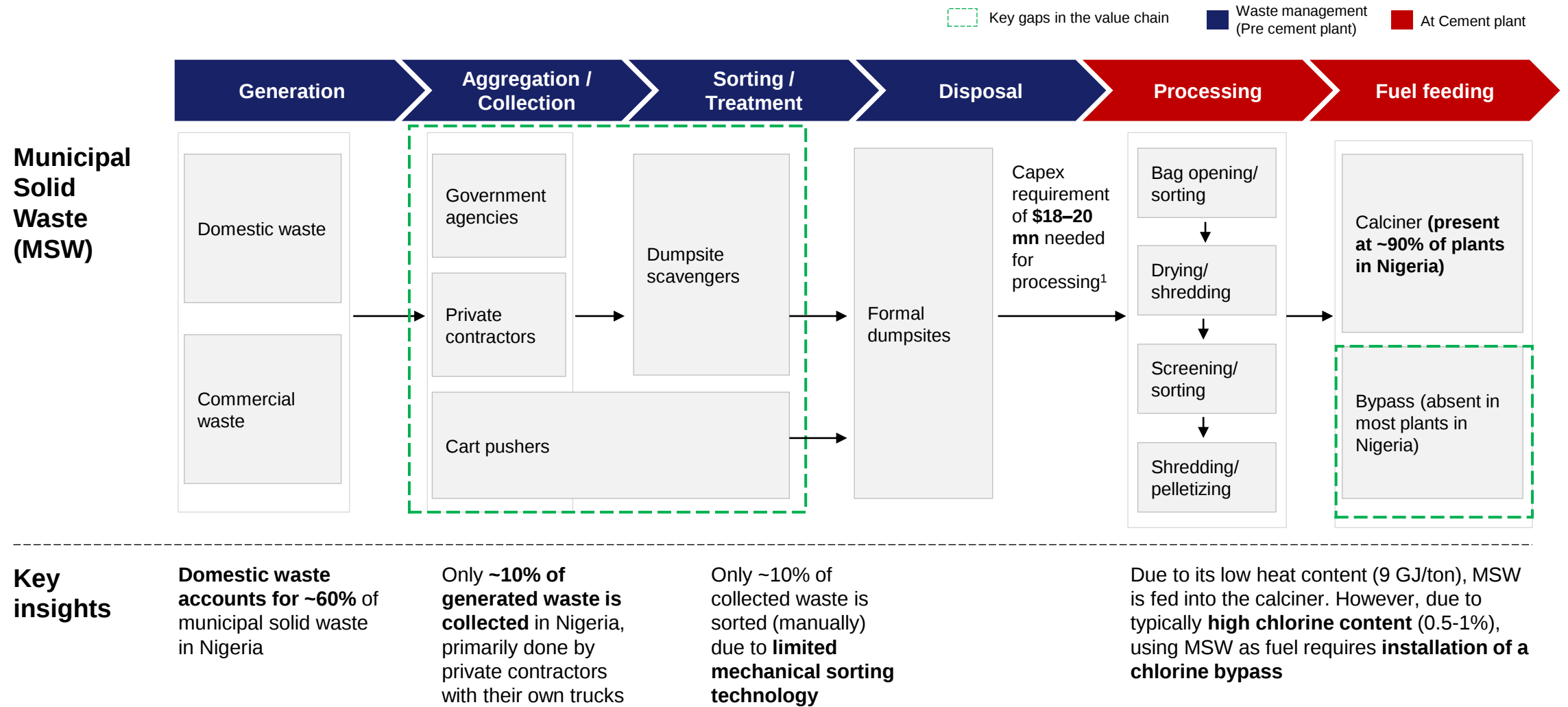
1. AF substitution target assumed based on 2 players' commitments due to lack of industry targets
2. Accelerated case for agricultural waste assumes amount of waste captured by cement industry annually, grows from 5% in 2022 to 30% in 2035 (vs 20% in Base case)
3. Accelerated case for MSW assumes waste collection rates increase to 50-70% in focus states by 2035 (vs 25-45% in Base case)

Key takeaways

Municipal solid waste could account for **12 – 21% of fuel mix by 2035**, depending on waste collection rates achieved in focus states

Agricultural waste could account for **14 – 27% of fuel mix by 2035**, depending on agricultural waste collection rates and the cement industry's share of waste collected

Municipal solid waste (MSW): Key gaps in the value chain are at the collection, sorting and fuel feeding steps

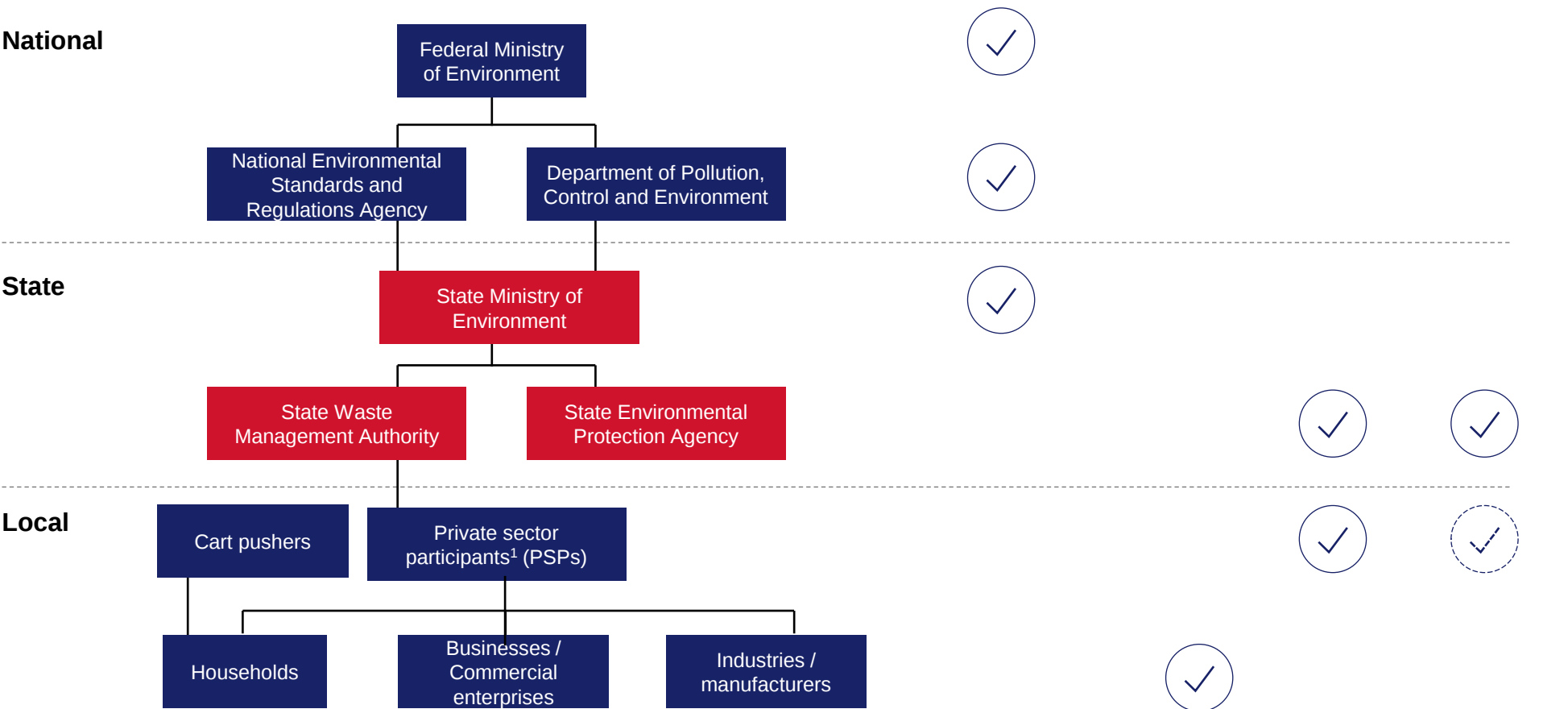


1. Includes costs of chlorine bypass, which is typically about ~\$10mn

Municipal solid waste management in Nigeria is decentralized, with each state government charged with management of its own waste

NOT EXHAUSTIVE

Institutional structure for waste management in Nigeria



1. PSPs are private waste collectors contracted by state waste management agencies
2. Some PSPs also have recycling operations (e.g., Wecyclers)
Source: UNIDO Report, Agency websites

Responsibilities across value chain

Deep dive follows

Comments

The main responsibility of waste management in Nigeria sits with state agencies

State waste management agencies are typically tasked with collecting municipal waste, but in some states, this is **partly outsourced to private sector participants (PSPs)**

PSP collectors are typically **highly fragmented in some states** E.g., >500 PSPs operate across 20 local government areas within Lagos State vs concentrated in some states such as Edo with 10-15 in Benin city alone

Although most states have dedicated waste management agencies, only a few have recently taken active steps to improve MSW collection

Focus states	WMA present	Relevant policies within the past 5 years
Lagos ¹		In 2021, Lagos State Plastic Waste Management Policy was developed to increase plastic waste recovery from ~10% in 2022 to 50% in 2035
Ogun		In 2020, Ogun State passed its Waste Management Authority Bill to improve collection of municipal solid waste and industrial waste in the state
Kogi		In 2022, the Kogi State Sanitation and Environmental Health Law was passed to ban the dumping of waste in unauthorized locations
Edo		In July 2023, Edo State signed it's a waste management policy to increase supervision of private waste collectors by local government authorities ²
Sokoto		<i>No recent policies found</i>
Cross River		<i>Reported interest in outsourcing waste management to private players³</i>
Benue		<i>No recent policies found</i>
Gombe		<i>No recent policies found</i>

1. Lagos included due to its proximity to cement plants in Ogun State

2. The new policy is still undergoing final reviews before being publicly announced

3. Based on expert interview with staff of waste management agency

Example State: Cement players have been unable to adopt MSW and industrial waste at scale due to certain challenges

	Generation	Collection	Aggregation / Sorting	Disposal
Current system		State agency collects municipal solid waste in public spaces (e.g., highways) and outsources collection of private municipal and industrial waste to PSPs PSPs remit 25% of revenues generated from fee collections¹ to state agency	PSPs transport both domestic and industrial waste to state agency-managed dumpsites, where both waste types are co-mingled Scavengers at dumpsites pay ~N40 per recovered plastic bottle to state agency and resell at ~N70 to collectors	
Potential system		Cement players have attempted to source industrial waste directly from manufacturers, and proposed exploring revenue-sharing options with government agencies	There is interest to collect waste from dumpsites, however cement players are unwilling to bear the full cost of developing a sorting line, pre-processing equipment (e.g., shredder) and transportation	

Comments

- “”

The waste agencies receive a lot of money from the industrial players which helps them meet their revenue targets...they see cement players coming in as competitors

- *Industry expert*
- “”

Cement companies can use the waste at dumpsites for fuel, but the government also needs to contribute something because we are offering them a service

- *Cement industry expert*

1. Fees range from as low as N500 to as high as N40,000 per month, depending on location
 Source: Expert interviews, Press search

Due to inadequate waste treatment, different states have reported challenges with dumpsites



Comments

- “ ” Olushosun dumpsite in Lagos is one of the biggest dumpsites in the world at over 40 hectares....the waste keeps piling up and is just left there unused
- **Waste industry expert**
- “ ” We engaged with a state waste management agency to permit us to collect waste directly from manufacturers....we proposed revenue sharing, but the agencies believe they can earn more with the current system
- **Cement industry expert**
- “ ” Cement companies can use the waste at dumpsites for fuel, but the government also needs to contribute something because we are offering them a service
- **Cement industry expert**

Project 1: Establishing a 250,000T material recovery facility (MRF) located within 100km of a major cement plant



Assumes MRF serves a 12MT-capacity cement plant

Current maturity vs vision state | ● Low ● Medium ● High

Enablers	Vision state	Current state	
Technology & Technical Knowledge	Availability of multi-fuel burners and chlorine bypass in cement plants Know-how exists for operating mechanical sorting technology, chlorine bypass etc	Most cement plants have multi-fuel burners but not chlorine bypass Some players have experience installing sorting lines and other plant modifications	●
Policy & Regulation	National and state policies (in all states) with clear waste collection and processing targets Government policies mandating delivery of waste to MRFs instead of dumpsites	No recent waste management policies in some states (e.g., Sokoto, Gombe, Benue) Plastic recycling targets exist in national policy, but none for MSW specifically States do not have waste collection targets	●
Financial viability	Concessional or grant financing (incl. carbon credits) to support \$20 - \$25mn required for initial capex investment Additional facility revenues generated through recyclable sales Track record of heavy industry players selling carbon credits in voluntary markets or via CDM¹	Potential financiers (e.g., IFC) have previously invested in Nigerian cement industry There is an existing market for recyclables in Nigeria No example of carbon credits sales in heavy industry manufacturing	●
Ownership/Operation	7-9 material recovery facilities (MRFs) present across states with cement plants	Only 2 MRFs in focus states currently, which are both operated by private entities (WENRG in Lagos and Jubilant Nigeria Ltd in Edo State)	●

Key stakeholders required to act

- Cement manufacturers (Dangote, BUA, Lafarge)
- State governments / State waste management agencies
- Federal government ministries e.g., environment
- Financiers (e.g., DFIs, commercial banks)
- Manufacturers (e.g., FMCG players)
- Government bodies e.g., NCCC, DCC

There are 3 main business models which cement players generally employ when using municipal solid waste as alternative fuel

Business Model	Description
① Full Integration	Cement player backward integrates into the municipal solid waste value chain, and engages in collection of waste from households and businesses, processes the waste and uses as RDF in its plants
② Partial Integration	Cement player backward integrates into the municipal solid waste value chain, and engages in sorting of municipal solid waste already aggregated at the dumpsites, processes the waste and uses as RDF in its plants
③ Full Outsourcing	A private facility operator processes the waste and sells the processed waste as RDF to the cement player which uses the RDF in its plants

Different stakeholders are needed to drive key actions for the successful implementation of this project

NOT EXHAUSTIVE

Key stakeholder groups	Action(s) required
1 Cement manufacturers and/or private MRF operators	- Invest in material recovery facility for RDF production and/or plant modifications required for to use RDF as fuel in kiln - Make required investments in developing project design document (PDD) to enable issuance of carbon credits
2 Financiers	- Provide concessional funding (equity, low interest loans or grant funding) to support development of material recovery facility - Provide incentives/concessions from government e.g., tax and levy concessions, land to support development of facility
3 State bodies e.g., waste management agencies	- Develop policies mandating waste collectors or transfer loading station operators to dispose waste in MRFs - Promote domestic and commercial waste collection through campaigns, investing in collection bins, licensing more PSPs etc
4 National government agencies	Develop necessary framework and approvals to enable successful issuance of carbon credits

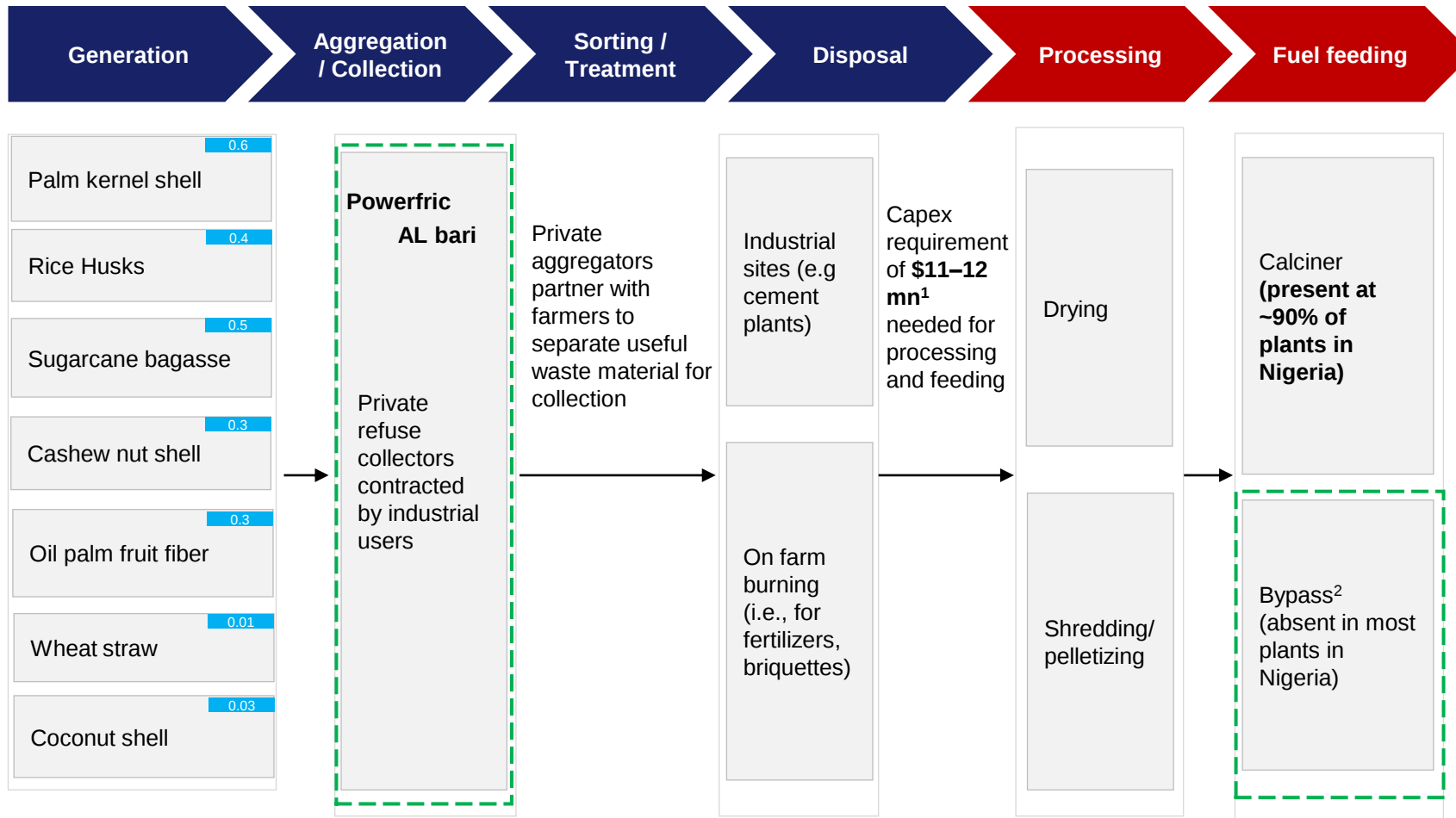
Aggregation/collection and fuel feeding gaps exist within the agricultural waste value chain

 Key gaps in the value chain

x Amount of feedstock generated in focus states (Mn tonnes)

 Waste management (before cement plant)

 Cement plant



1. Includes cost required for chlorine bypass

2. Bypass only required for rice husk and wheat straw due to their high chlorine content (>0.2%)

Key Insights

- **Palm kernel shell** is the largest available feedstock and is already being used in the **Dangote and Lafarge manufacturing plants**
- **Coconut shell, rice husks, and oil palm fiber** are also used in smaller quantities by the players
- There are opportunities for **investment in the aggregation/collection phase of the value chain**, to standardize the agricultural waste collection process
- The **absence of a chlorine bypass in most plants in Nigeria**, could hinder the use of certain Agricultural-waste e.g., rice husks and wheat straw

Of the various stakeholders in the ecosystem, local stakeholders are the most active in the agricultural waste management process

NOT EXHAUSTIVE PRELIMINARY

Minimal activity Active

Deep dive follows

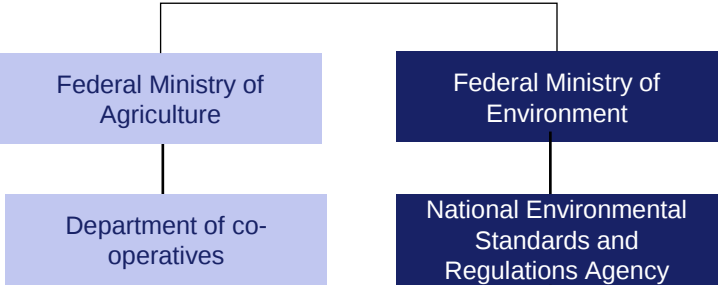
Specific to Agricultural waste

Institutional structure for waste management in Nigeria

Responsibilities across value chain

Policy setting/enforcement	Waste generation	Waste collection	Waste processing
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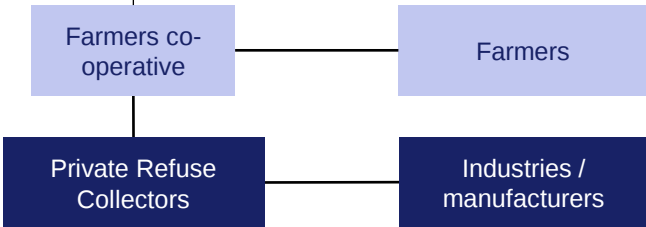
National



State



Local



Comments

Agricultural waste management in Nigeria is **predominantly handled by the local players**

Government players at state and national level have **minimal involvement** in agricultural waste management

All agricultural ministries, departments and agencies at national to local level are key actors that are relevant to agricultural waste but not MSW

Most waste management policies have limited implication on agricultural waste

NOT EXHAUSTIVE

PRELIMINARY



No implication



Minimal implication



Moderate implication

Focus region	Relevant policies in the last 5 years	Implication on agricultural waste
Lagos	In 2021, Lagos State Plastic Waste Management Policy was developed to increase plastic waste recovery from ~10% in 2022 to 50% in 2035	
Ogun	Ogun state waste management authority bill in 2020 to improve the collection of solid waste and outlining the registration process for private waste collectors	
Kogi	Implementation of Medium-Term Sector Strategy (MTSS) which includes strategies on sanitation and waste management ¹	
Edo	In July 2023, Edo State signed it's a waste management policy to increase supervision of private waste collectors by local government authorities	
Sokoto	<i>No recent direct policies on general solid waste management</i>	
Cross River	<i>No recent policies on solid waste management</i>	
Benue	<i>No recent policies on solid waste management</i>	
Nasarawa	No policy on waste management in the state; 2021 law on waste management and sanitation. No policies guiding agricultural waste management	

1. Specific actions towards strategy implementation include; reducing illegal refuse dumps in the state, strengthening public private partnerships by increasing manufacturing potential in the state

Source: Press search, official federal ministry of environment website, Ogun state environmental policy document

Key Insights

- There is room for improvement in agricultural waste management across the focus regions
- Unlike municipal solid waste, there are limited policies around agricultural waste management, and the existing solid waste management policies have minimal implication on agricultural waste

Comments

Government e.g., state agencies doesn't get as involved in agricultural waste management given a lot of this is in the hinterlands and requires a lot of capacity/resources. The space is still very green and activities are driven by private players

- Waste Management Expert, Edo State

Government regulations in the past have been focused on controlling the smoke emitted from the burning of agricultural waste in certain parts of the state

- Private aggregator, Ogun State

Project 2: Establishing a 140,000 tonnes integrated biomass processing facility located within 100km of a major cement plant



ILLUSTRATIVE FOR NIGERIA CONTEXT



What is an integrated biomass facility?



An integrated biomass facility **manages the biomass processing cycle**, starting from waste aggregation to fuel processing



This facility provides **specific (or combination of) services to farmers in exchange for waste** which is processed at the facility



It is **within 100km of the cement plant** and generates **~140,000 tonnes** of agricultural waste annually



What can be offered in exchange for waste?

1 Equipment hiring

Providing farm equipment for hire to farmers (through their farmer associations), at a subsidized rate, in exchange for waste from the crops produced

2 Market linkage

Creating the market for produce of farmers (through their associations) by connecting farmers with offtakers/potential buyers for the produce, in exchange for their waste¹

3 Mixed

Offering both equipment hiring and market linkage in exchange for waste

1. This service might not require a facility/center and can be done by leveraging existing programs where farmer associations are being connected to potential buyers. Cement players could be a type/category of buyers connected to farmers but for purchasing waste rather than produce

Project 2: Establishing a 140,000 tonnes integrated biomass processing facility located within 100km of a major cement plant



Enablers		Current maturity vs vision state ● Low ● Medium ● High	
Technology & Technical Expertise	Vision state	Current state	
	Availability of necessary equipment at the different stages of the value chain e.g., chlorine bypass for the cement plant	Majority of the cement plants in Nigeria are not fitted with chlorine bypass	●
Policy & Regulation	Adequate technical expertise among farmers e.g., on farm machinery, proper waste management practices, value of waste	Limited widespread knowledge among farmers on the value of waste and the impact of best practice waste management on the environment	●
	Establishment of target policies to guide agricultural waste management activities such as registration of private players, targets/commitments on agricultural waste to be turned to value etc Established carbon market frameworks Data driven policy generation and implementation	Although solid waste management policies exist, there are no specific policies or regulations for agricultural waste management Unveiling of Equipment Leasing Registration Authority by the Federal Government to drive Equipment Leasing Act of 2015 as an alternative to loans Nascent stage on carbon market regulatory guidance Absence of concrete data on agricultural waste generation	●
Financial viability	Concessional or grant financing to support up to \$~1mn required for initial capex investment	Potential financiers (e.g., DFIs) have previously invested in Nigerian cement industry	●
Ownership/Operation	Availability of potential operators e.g., sizeable standalone biomass collectors and processors	Agricultural waste management is currently fragmented – collection is done by small scale private operators and processing is also fragmented- with some done by smaller processors and some processed at the cement plant	●

Key stakeholders required to act

- Cement manufacturers (Dangote, BUA, Lafarge)
- State governments / State waste management agencies
- Federal government ministries (e.g., environment, agriculture)
- Financiers (e.g., DFIs, commercial banks)
- Industry Associations e.g., MAN, CEMAN
- Manufacturers (e.g., FMCG players)
- Farmers co-operatives/associations

There are 3 main business models which cement players generally employ when using agricultural waste as alternative fuel

Business Model	Description
① Full Integration	Cement player backward integrates into the agricultural waste value chain, and engages in generation of agricultural produce, extracts the agricultural waste , processes the waste and uses as fuel in its plants
② Partial Integration	Cement player backward integrates into the agricultural waste value chain, and engages in aggregation of agricultural waste, processes the waste and uses as fuel in its plants
③ Full Outsourcing	A private facility operator aggregates and processes the waste and sells the processed waste as fuel to the cement player which uses the fuel in its plants

Different stakeholders are needed to drive key actions for the successful implementation of this project

NOT EXHAUSTIVE

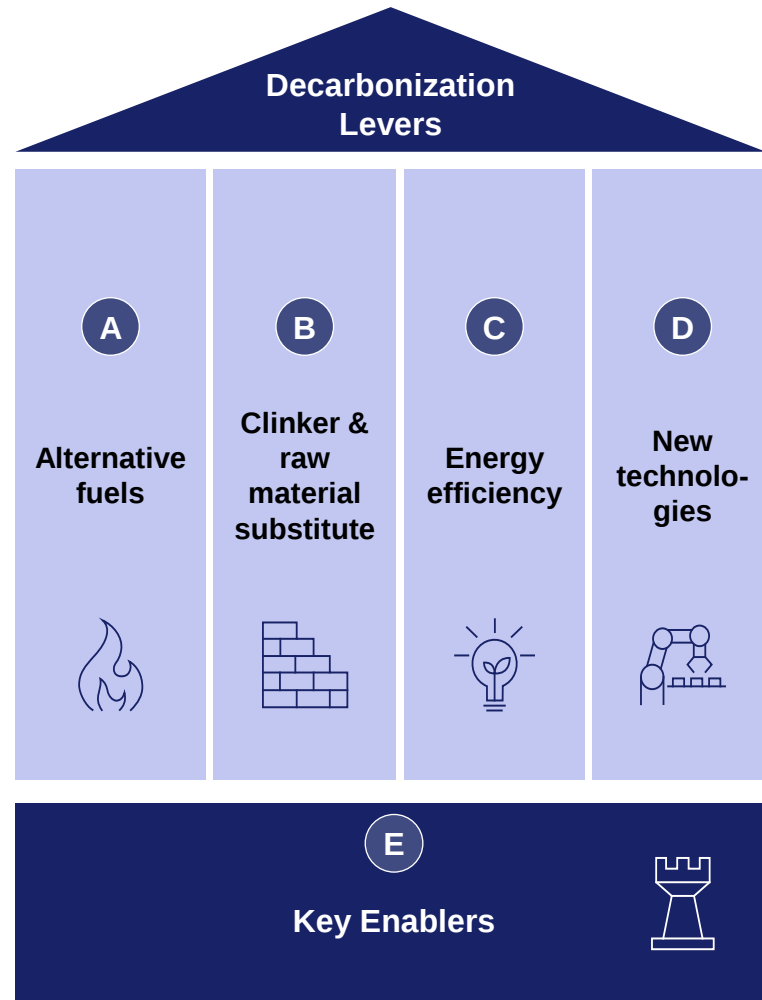
Key stakeholder groups	Action(s) required
1 Cement manufacturers or private biomass facility operators	• Own and invest in integrated biomass facility and/or plant modifications e.g., chlorine by pass¹ required to use as fuel in the kiln • Make required investments in developing project design document (PDD) to enable issuance of carbon credits
2 Farmer Associations/Co-operatives	• Implement capability building/educational programs for farmers on waste management practices and value, farm machinery usage etc. • Co-invest in biomass facility equipment (where needed) • Act as conduit between cement players and farmers (where needed) for market linkage (with offtakers) for produce • Establish quality control measures among farmers e.g., to ensure delivery of agreed output, to prevent mismanagement of equipment etc.
3 Government agencies – state waste management agencies, state ministry of agriculture (department of cooperatives)	• Establish policies to guide agricultural waste management e.g., policies on waste disposal, reporting, and collection, state agricultural waste to energy targets etc. • Establish necessary frameworks for carbon credit sales through national councils e.g. NCCC²
4 Financiers (& state governments where applicable)	• Provide concessional funding (equity, low interest loans or grant funding) to support development of biomass facility • Provide incentives/concessions from government e.g., tax and levy concessions, land to support development of facility

1. Chlorine bypass is needed for agricultural waste fuel that is high in chlorine content e.g., rice husks and wheat straws so need will depend on the type of agricultural waste being used

2. NCCC= National Council on Climate Change

We developed a decarbonization implementation plan for the Nigerian cement industry based on 4 main levers and key enablers

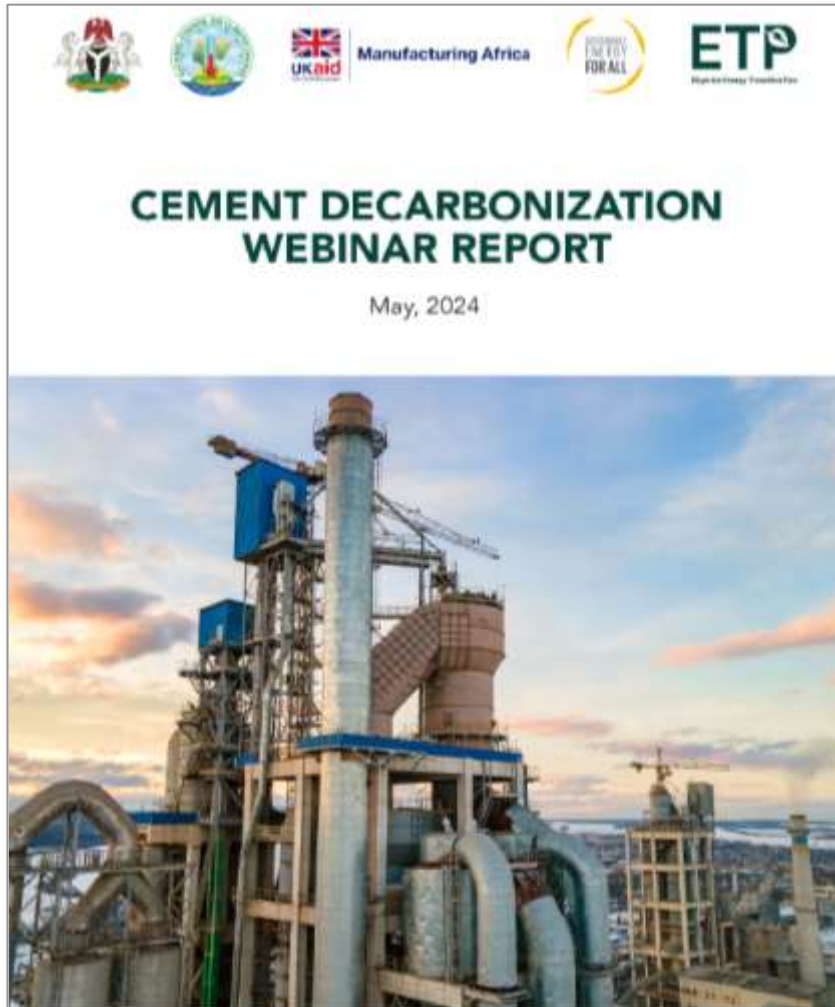
 Range of emission reduction potential by 2035



Decarbonization Levers	High Level Key actions
A Increase the use of alternative fuels 20% - 25%	Increase availability of and access to waste through scaling aggregation, collection and management of agricultural waste and municipal solid waste Increase usage of waste through investment in necessary infrastructure e.g., material recovery facility, biomass processing facility
B Increase adoption of clinker substitutes 15% - 20%	Conduct R&D studies for low-carbon "green cement" types Establish standards and regulations around green cement production Invest in access to raw materials for clinker substitutes Create awareness and promote customer education on green cement
C Improve energy efficiency of the plant 5% -10%	Analyze opportunity for energy efficiency present in the Nigerian cement industry Share best practices among cement manufacturers regarding operational excellence and energy efficiency practices
D Development of new technologies (CCUS ¹ , Hydrogen and Kiln Electrification) 45% - 60%	Carry out R&D studies with collaborative sectors and research organizations Analyze opportunity for new technologies adoption in Nigeria's cement industry Identify and select potential pilots for the implementation of new technologies
E Key Enablers -	Set overarching decarbonization vision and agenda for the Nigerian cement industry Develop carbon emission reduction strategy for the industry Institute decarbonization governance/guidance mechanisms for the cement industry

1. Carbon Capture, Use and Storage

Dissemination was a core theme of this effort ...



- Webinar co-hosted with Nigeria's Energy Transition Office, SEForAll and Nigeria Council for Climate Change
- 100+ participants from industry (cement players, waste management players), academia and government

Insights shared include:

- The various decarbonization levers for the cement industry and their potential for emissions reduction
- The waste-to-energy opportunities (municipal solid waste and agricultural waste) including potential projects and commercial value propositions for the cement industry
- A high level view of actions various stakeholders need to take to harness the waste-to-energy opportunities for further decarbonization of the cement industry



... with the aim of moving from concept to action



Planning workshop held in Ogun State (host state for 2 of the 3 major cement players) to **co-create an action plan for stakeholders to execute waste-to-energy projects** in the state

20+ attendees, including government (Commissioner of Environment and other key officials), cement players, development organizations and financiers

Commitments made by the group include:



- Setting up a multi-stakeholder working group focused specifically on executing an MRF project in Ogun state.
- Creating an independent SPV that is focused on executing such waste-to-energy projects starting with MRFs.
- NSIA Carbon Vista Fund's commitment to support and fund projects that meets their eligibility criteria

The 1st working group meeting will hold on May 27

Thank you