# Plastic Waste, Refuse Derived Fuels (RDF) and Cement Kilns in Nigeria

## Pan African Vision for the Environment

**SUSTAINABLE ENVIRONMENT DEVELOPMENT INITIATIVE (SEDI)**

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**1.0 Introduction**

Plastic litter is a major global environmental problem with its production drastically increased by more than twenty-folds between 1964 and 2015, with an annual output of 322 million metric tonnes, which is expected to double by 2035 and quadruple by 2050 if no action is taken. The mismanaged plastic waste mostly originating from land is not only contaminating the land but released to marine environment, polluting it and threatening biodiversity while also negatively impacting the blue economy. Mismanaged plastics and inadequate waste management is also a source of GHG emissions. The amount of waste has been gradually increasing due to reasons such as human activities, population growth, improvisations regarding to living standards, changes in consumption materials and urbanization. The ecosystem can only clean certain amounts of waste in a couple of years or longer, however, today the total amount of waste forces the capacity of ecosystem and exceeds its effects on top of the cleaning threshold of the ecosystem (Bölükbaş & Akıncı, 2018).

Nigeria's cement industry has traditionally used natural gas, imported coal and some domestic petroleum and coal5 to supply heat for processing limestone into clinker, the main ingredient of cement. While fossil fuels are plentiful in Nigeria, cement companies are increasingly exploring 'co-processing' with alternative fuels (AF), primarily bioenergy. This drive has been led by Lafarge Africa and its AF subsidiary, Geocycle, which now co-processes biomass with fossil fuels at four of its five plants. Dangote is also planning to start co-processing fossil fuels with AFs at two of its plants, consistent with a corporate push towards AFs (Dangote Cement, 2020).
Until the early-2000s, it was cheaper to import cement to Nigeria than to produce it locally, so Nigeria's cement output was low and it was a net importer for several decades. Within the past 20 years, however, Nigeria has become the largest cement producer in Africa, producing over 50 Mt in 2018 and exporting more than 20%. There are 11 cement plants at nine factory sites in Nigeria. Lafarge Africa has five plants, with three in Ogun State (at Ewekoro I, Ewekroro II and Sagamu), one at Ashaka in Gombe State and one in Mfamosing in Cross River State. Dangote owns the country's largest factory at Obajana in Kogi State, as well as Ibese Cement in Ogun State and Gboko Cement in Benue State. BUA operates Obu Cement in Edo State (with two production lines) and Sokoto Cement in the far northwest at Kalambaina in Sokoto State.

**1.1 Statement of Problem**

There is a widespread recycling of plastics which has largely failed over time. Individuals and governments are now turning to burning plastics to claim they are either recycling plastic waste through energy recovery or diverting it from landfill. Many developed countries manufacture and export refuse derived fuel (RDF) to developing countries like Nigeria and this has been an issue of concern as these materials are used for burning. They contain very high quantities of plastic that is used as fuel in cement kilns by our local industries such as the cement industries(Lafarge, Dangote cement group, etc.), when these industries burn these products, they cause $CO_2$ emissions and a lot of harm to the environment and human health.

**1.2 Objective of the study**

The objective of the study is to report on plastic waste, refuse derived fuels (RDF) and cement kilns in Nigeria.

**1.3 Plastic Waste Situation in Nigeria**

Over the years the demand for plastics in Nigeria has grown. About 70% of plastic raw materials used in Nigeria are imported (mainly from the Middle East, Europe and Asia) and only 30% produced locally. In the years 2008 to 2015, imports of plastic raw materials increased annually by 7.2% from 464 kt to 754 kt. This makes Nigeria one of Africa's largest importers of plastics in primary forms. There is growing pressure of plastic litter on our cities, farms, atmospheric, marine ecosystems and biodiversity. Increased greenhouse emission burden, public health issues, and climate change challenges because the substances emitted by the incineration or open burning of plastic-containing refuse are often hydrochloric acid (HCl), ammonia, carbon monoxide (CO), sulphur dioxide, nitrogen oxide, sulphides and dioxins. The summary cost of policy inaction to the lifecycle management of plastic would result in increasing the unsustainability of the Nigerian Environment. Per capita consumption of plastics in Nigeria has grown by 5% annually over the past 10 years from 4.0kg in 2007 to 6.5kg in 2017. Seasonal demand factors shorten product lifecycle fueled by the growing use of 'single-use' plastics, have increased the consumption patterns of plastic goods. Field survey in 2017 on plastic waste generation in Nigeria revealed that the packaging industries contributed 63%, while the electrical and electronics contributed 8%, construction and demolition contributed 5%, agriculture 2%, Non-packaging households and others contributed 18%. The survey estimated about 1.5 million tonnes of plastic waste are generated in Nigeria every year. Of these less than 30% of such waste is collected for recycling. The collected and uncollected waste managed through open dumping practices and /or burning ultimately presents a serious concern for various environmental media, including the terrestrial (contamination of farm soil), atmospheric (microplastic-related lung infection) and aquatic environments thus causing causes economic damage to activities such as tourism, fisheries and shipping. In addition to these, is the knowledge that plastics production and the incineration of plastic waste give rise globally to tonnes of $CO_2$ a year. Thus, raising the need for plastic waste management; taking cognisance of lifecycle approach in Nigeria to develop systemic solutions that make, use, reuse and prevent plastic from becoming waste.

In Nigeria, less than 12% of plastic waste is recycled. There is no current capacity for energy recovery in cement kilns or incinerators with heat recovery. About 80% of plastic waste goes to landfills and dump sites. Other disposal options include open burning and landfill fires, resulting in air pollution (UNIDO, 2021).

**1.4 Actions and Initiatives to Reduce Plastic Litter in Nigeria**

Amid growing concern on plastic pollution, various efforts are being made in Nigeria at different levels. At Federal Government level, some relevant policies have been adopted including: National Policy on Solid Waste Management adopted in 2020 and treats solid waste as a resource to promote economic growth and managed to improve the quality of human and environmental health. The policy follows 13 principles, amongst others: Proximity principle and self-sufficiency; Polluter pays principle; Extended producer responsibility; the precautionary principle; Separation at source; Life cycle. Also, plastic recycling, especially PET bottles, is promoted. National Policy on Plastic Waste Management was also adopted in 2020. The overall goal of the policy is to promote sustainable use of plastic as a resource throughout its life cycle. The policy introduces new measures such as the following:

- Aim to ban single use plastic bags and styrofoam (Micron > 30 µ) by December 2028 and apply a levy on thicker plastic bags and promote the use of alternatives to plastics (e.g., jute bags, leaves, paper, etc.).
- Aim to ensure that all plastic packaging in the market is recyclable or biodegradable or compostable and reusable by 2025.
- Set national and state-wide targets for 65% recycling rate for municipal waste; 75% recycling of packaging waste; reduction of land filling to maximum 10% of municipal waste; 50% recycling of all plastic waste; and use of plastic bags per person to be reduced by 50% by 2030.
- Requires mandatory EPR schemes most notably on all packaging items and introduces by law a nationwide bottle deposit requirement, a 5% deposit refund scheme for beverage containers, 5% charge on all single use grocery bags by 2021.

Table 1 shows Nigeria Plastic Production Data (2009 – 2020). Average consumption data for plastics by application from 2009 to 2020 is presented in Table 2. Plastics Consumption by Application (2009 – 2020) is presented in table 3. Average consumption data for plastics by processing method, from 2009 to 2020 is shown in table 4. Plastic Waste Treatment Methods is presented in table 5.

**Table 1: Nigeria Plastic Production Data (2009 – 2020)**

| Year | Plastic production in metric tones |
|---|---|
| 2009 | 213 |
| 2010 | 206 |
| 2011 | 303 |
| 2012 | 335 |
| 2013 | 390 |
| 2014 | 396 |
| 2015 | 411 |
| 2016e | 428 |
| 2017e | 442 |
| 2018e | 462 |
| 2019e | 495 |
| 2020e | 513 |

(Euromap, 2016): Plastics Resin Production and Consumption in 63 Countries Worldwide: 2009-2020)

**Table 2: Nigeria Plastics Consumption Data (2009 – 2020)**

| **Year** | **Nigeria plastic consumption in metric tones** |
|---|---|
| 2009 | 672 |
| 2010 | 713 |
| 2011 | 780 |
| 2012 | 821 |
| 2013 | 921 |
| 2014 | 1,010 |
| 2015 | 1,072 |
| 2016e | 1,142 |
| 2017e | 1,229 |
| 2018e | 1,322 |
| 2019e | 1,424 |
| 2020e | 1,533 |

(Euromap, 2016): Plastics Resin Production and Consumption in 63 Countries Worldwide: 2009-2020)

**Table 3: Plastics Consumption by Application (2009 – 2020)**

| Application | Average consumption by application in percent (2009 – 2020) |
|---|---|
| Packaging | 53.1 |
| Automotive | 5.8 |
| Construction | 16.3 |
| Electrical/Electronic/IT | 3.4 |
| Others | 21.4 |
| Total | 100.0 |

Euromap (2016)

**Table 4: Average Consumption by Processing Method (2009 – 2020)**

| Application | Average consumption by processing method in percent (2009 – 2020) |
|---|---|
| Injection molding | 24.0 |
| Extrusion | 52.3 |
| Blow molding | 8.5 |
| EPS foam molding | 0.2 |
| PET preform blow mold | 7.3 |
| Total | 100.0 |

Euromap (2016)

**Table 5: Plastic Waste Treatment Methods**

| Treatment method | Plastic waste treatment in percentage |
|---|---|
| Recycle | 10 |
| Dumpsite | 80 |
| Others (open burning, incineration, etc.) | 10 |

Euromap (2016)

### 1.5 Plastics Imported as Products

The total amount of plastics imported as products between 1996 and 2014 was approximately 3,420,000 tons. This represents about one-quarter of plastics imported in primary form. This shows that plastic products are generally produced from imported primary plastics in Nigeria. The imported products include rods, tubes, pipes and hoses, floor coverings (rolls and tiles), wall coverings, ceiling covering, plates, sheets, builders' wares, reservoirs, tanks, articles of apparel and clothing accessories (including gloves, mittens and mitts), fittings for furniture, and ornamental articles. These products are mainly comprised of construction and household materials, which are now old enough for replacement (import reporting started in 1996, approximately 27 years ago). While reservoirs and tanks at their end-of-life form a considerable fraction of the recycling stream, other products in this category usually end up in dumpsites. When buildings are demolished, concrete, wood and metals are targeted for reuse/recycling, while plastic materials are usually disposed of in dumpsites.

## 1.6 Plastic policy in Nigeria

**National policy on environment** (revised, 2016), plastic-related:

- To secure and enforce a legislative ban on plastic bags; and
- To restrict and/or tax the use of polluting non-biodegradable consumer products, including plastic shopping bags.

**National policy on solid waste management** (2018), plastic-relevant:

- Categories for sorting should include glass, paper, plastics etc. for reuse;
- Promote technologies for recycling of waste components including plastics;
- National Waste Management Resource Action Program, Producers' responsibility for plastic, plastic as business opportunities in waste to wealth; and
- Promotion of plastic recycling, especially PET bottles.

**Plastic waste management** (2020), overall goal of the approved national policy on plastic waste management is to promote sustainable use of plastic as a resource through its life cycle management. The policy introduces new measures such as the following:

- Limit the impact of littering of single-use plastic packaging product and waste materials;
- Ban single use plastic bags and styrofoam (Micron > 30 μ) and levy on thicker plastic bags and promote the use of alternatives to plastics (e.g. jute bags, leaves, paper, etc.) effective May 2020.
- Ban plastic bags, cutlery, styrofoam and straws, effective January 2025; Ensure that all plastic packaging in the market are recyclable or biodegradable or compostable and reusable by 2030.
- Phase out single-use plastic bags and Styrofoam, effective December 2028;
- Sets national and state-wide targets for 65% recycling rate for municipal waste,75% recycling of packaging waste, reduce landfill to maximum of 10% of municipal waste, 50% recycling of all plastic waste, and use of plastic bags per person reduced by 50% by 2030;
- Requires mandatory EPR schemes most notably on all packaging items and introduce by law a nationwide bottle deposit requirement, a 5% deposit refund schemes for beverage containers; 5% charge on all single use grocery bag by 2021; alternatives are exempted from fines, no mention of bio-based plastics but biodegradables being exempted from fines; transform all plastic products, packaging materials and its waste to resource materials; and
- Generate a database on plastics, amongst others.

Presently, there have not been key actions on plastic policy implementation, but this report hopes to stimulate activities towards policy action.

## 2.0 Overview of Cement sector

Nigeria is Africa's most populous country. It is also SSA's largest cement manufacturer, with an annual production capacity of nearly 50 million tonnes (Mt) in 2018 (Global Cement, 2018), of which nearly a quarter is exported. Cement production is now Nigeria's leading manufacturing industry and leading industrial greenhouse gas (GHG) emitter (Federal Ministry of Environment, 2020). The sector is dominated by Dangote Cement, followed by Lafarge Africa (a subsidiary of the Holcim Group, the world's largest cement company) and the BUA Group. While being a more recent entrant to cement production, Dangote is now Nigeria's top cement producer accounting for over 60% of national cement production (Dangote Cement, 2020).

There are 11 cement plants at nine factory sites in Nigeria. Lafarge Africa has five plants, with three in Ogun State (at Ewekoro I, Ewekroro II and Sagamu), one at Ashaka in Gombe State and one in Mfamosing in Cross River State. Dangote owns the country's largest factory at Obajana in Kogi State, as well as Ibese Cement in Ogun State and Gboko Cement in Benue State. BUA operates Obu Cement in Edo State (with two production lines) and Sokoto Cement in the far northwest at Kalambaina in Sokoto State. Nigeria's cement industry has traditionally used natural gas, imported coal and some domestic petroleum and coal to supply heat for processing limestone into clinker, the main ingredient of cement. While fossil fuels are plentiful in Nigeria, cement companies are increasingly exploring 'co-processing' with alternative fuels (AF), including refuse derived fuels.

### 2.1 Processed Engineered Fuel (PEF)

Processed Engineered Fuel (PEF) is a practical alternative to the use of fossil fuels in cement kilns. The process harnesses the energy contained in combustible material such as recyclable plastics, cardboard, paper and waste timber that would usually go to landfill. This is an unsustainable way of energy production.

### 2.2 Solid Recovered Fuel (SRF)

SRF is a fuel produced by drying, filtering, and shredding solid waste. Solid recovered fuel usually consists of the combustible components obtained from municipal solid waste. SRF may be derived from food and kitchen waste, paper, green waste, plastic bottles, toys, fabrics and composite waste. This is an unsustainable way of energy production.

### 2.3 Waste Derived Fuel (WDF)

Waste-derived fuel is a fuel typically derived from waste(s) and generally used as a substitute for conventional fossil fuels. Waste-derived fuels can include fossil fuels such as waste oil, plastics, or solvents; biomass such as dried sewage or impregnated saw dust; or fractions of both fossil fuels and biomass such as municipal solid waste or tires. This is an unsustainable way of energy production.

### 2.4 Use of Refuse Derived Fuel

Refuse derived fuel (RDF) is fuel obtained from various kinds of combustible, non-biodegradable solid waste such as plastic, polythene, wood, commercial wastes and industrial wastes. It also finds its uses as an alternate fuel in industries such as cement.

There are three ways that alternative fuels can be co-processed in cement plants. It can be burned directly in the pre-calciners or the kiln as either (i) loose or pulverized material, or (ii) as solid fuel in the form of pellets or briquettes; or (iii) it can be transformed into producer gas for co-processing in the kiln using a gas burner. The use of biomass and other alternative fuels requires adjustments to the air flow in the pre-calciner and calciner to ensure complete combustion, according to the carbon, hydrogen and sulphur content of the constituent fuels and their co-processing proportions. Switching from conventional fuels to alternative fuels presents additional challenges. These include poor heat distribution, unstable pre-calciner operation, blockages in the pre-heater cyclones, build-ups in the kiln riser ducts, higher SO2, NOx and CO emissions, and dusty kilns (Chinyama, 2011). Fuel substitution also affects the chemistry of the cement. Ash is an important consideration. The main constituents of fuel ash are silica and alumina compounds. These combine with the raw materials to become part of the clinker. The percentage of silica in the ash in an AF therefore limits the level at which it can replace conventional fuels.
These wastes include plastics and paper/card from commercial and industrial activities (i.e. packaging waste or rejects from manufacturing), waste tyres, biomass waste (i.e., straw, untreated waste wood, dried sewage sludge), waste textiles, residues from car dismantling operations (automative shredder residues - ASR) and hazardous industrial wastes with high calorific value, for example, waste oils, industrial sludge, impregnated sawdust and spent solvents.

**Tyres**
Tyres have a typical high calorific value of 28.5 to 35 MJ/kg. Typical composition and requirements for tyre derived fuels is given in Table 3.5 below. They contain relatively high levels of iron, sulphur (≈1.6%) and zinc (≈1.5%).

**Used oils**
Untreated waste oils are commonly used as secondary fuels. In addition, a proportion of collected waste oils receives limited treatment (separation of water and sediment) and is also re-used as fuel in cement kilns.

**Plastics**
Examples of plastic waste processed into secondary fuels include non-recyclable plastics such as plastic bags from retail outlets or rejects from industrial processes. Some plastics are derived from source-separated MSW. Plastics usually have a high calorific value (29-40 MJ/kg). It is usually shredded and mixed with other waste before injection. The principal limiting factor in plastics is chlorine content, mainly in polyvinyl chloride (PVC).

**Waste wood**
Waste wood has a calorific value ranging between 15 and 17 MJ/kg at 10 to 15% residual water. If the wood has been treated or painted concentrations of heavy metal (As, Cr, Cu), chlorine compounds and other toxic substances may be high.

**Paper and paper sludge**
Waste paper is used as alternative fuel usually together with plastic and other waste. Paper has a typical calorific value of 12.5-22 MJ/kg. Sludge or residues from the production of paper are also

used secondary fuels mainly by paper industry itself. Paper sludge has a lower CV of about 8.5 MJ/kg.

**Sewage sludge**
Dried sewage sludge (more than 90% ds) can be used as fuel in cement kilns in conjunction with other solid waste types. Dried sewage sludge has a calorific value of 16-17 MJ/kg.

**Animal Waste**
Animal wastes (bone meal and animal fats) have a typical CV of 16-17 MJ/kg. Rendered animal meal and fats are prepared at approved processing facilities. Animal carcasses from non-BSE infected animals undergo extraction of the spinal cord, nervous systems, tonsils and eyes, sterilization (at 133°C under a pressure of 3 bars for at least20 minutes) and then grinding. Meat not fit for human consumption, which is now banned from animal feed, is processed to extract fats and then also ground. These wastes are reported to have a high calorific value and are of stable composition.

**Waste wood**
Waste wood from mills, panel production (MDF) and furniture production are usually re-used in panel production or burned to generate process energy on site. This is usually not available for energy recovery in other sectors. Waste wood from households or industrial sectors (i.e., construction/demolition, railway, others) on the contrary is potentially available for energy recovery.

## 2.5 Institutional framework in the Cement Industry

The key stakeholders in Nigeria's cement sector are government ministries and agencies at federal and state levels, as well as private sector manufacturers and non-government actors such as industry associations. The institutional framework for the industry is led by the Federal Ministry of Mines and Steel Development (MMSD), which licenses and oversees limestone extraction through its Mines Environmental Compliance Department and Mines Inspectorate Department. The Council of Nigerian Mining Engineers and Geoscientists advises the MMSD and sets professional standards for mining in Nigeria. The Standards Organization of Nigeria sets and enforces standards for cement production, which has stimulated significant local investment. The Federal Ministry of Industry, Trade and Investment has been a champion for the expansion of the sector, given its contribution to industrial development, rural employment and foreign exchange-earning. Together with the MMSD, it has supported the rapid growth of cement production and exports. The Council of Nigerian Mining Engineers and Geoscientists advises both federal and state governments on technical aspects of cement production, including fuel use and energy conservation. The Cement Manufacturers' Association of Nigeria is currently dormant, so there is no strong advocacy organization specifically for the sector, but the Manufacturers' Association of Nigeria, in which cement companies have a strong voice, provides support and advocacy to all major companies. The main cement-producing States of Ogun, Gombe, Ebonyi, Benue, Cross River and Sokoto have environmental protection agencies, departments of environmental conservation and resource management, and departments of mines, lands, water, industries, roads and other infrastructure support agencies.

**2.6 Incineration**

Incineration is the conversion of toxic waste in a thermal combustion process yielding bottom ash, fly ash and gases as products, a process of reduction of waste volumes and energy recovery. When agricultural wastes are combusted in the open, polycyclic aromatic hydrocarbons (PAHs) and some Potentially Toxic Elements (PTEs) in fly ash are released.

Incineration is simply defined as the primary and most conventional thermal waste-to-energy conversion technology.

Incineration is not a preferred method of waste disposal because it can result in the emission of dioxins and other atmospheric pollutants, and it contributes to global warming. The potential contaminants could also decrease quality of life and human health. Furthermore, the high moisture content of some solid wastes impedes the incinerators from running at maximum efficiency because the incinerators must expend extra energy in order to evaporate off the moisture in the waste. Additionally, incineration (combustion) cannot recover monomers that constitute the wasted polymer, and are therefore unfavorable to the enviroment.

**2.7 Nigeria Regulatory Requirements for Incineration**

Environmental Guidelines and Standards in Nigeria are mainly regulated by Federal Ministry of Environment (FMEnv), Department of Petroleum Resources (DPR), and National Environmental Standard Regulation and Enforcement Agency (NESREA).

Some of the guidelines for regulating Incineration activities in Nigeria set by the regulatory agencies are:

1. Incineration shall be carried out for either total destruction and/or recycling (resources recovery) of the hazardous materials;
2. All incinerators shall be designed, constructed, and operated to meet performance standards as follows;
3. An incinerator burning dangerous waste shall be designed, constructed, and maintained so as to provide for fugitive emission control;
4. Incinerators shall achieve a Destruction and Removal Efficiency (DRE) of 99.9% of Principal Organic Hazardous Constituents (POHCs) and Dangerous Combustion by-products (DCBP).

The incinerator shall destroy dangerous combustion by-product and limit emission of HCI particulate matters and ash etc.

Other regulatory requirements specified; waste analysis performance standard, operating requirements, monitoring and inspection as contained in the regulatory documents of DPR, FMEnv and NESREA respectively.

Clearly, incinerators do not meet this regulatory requirements and should be phased out of use.

## 3.0 Waste To Energy (WTE) Projects in Nigeria

There are a total of 7 dumpsites in Lagos state, Nigeria. Two of the biggest sites are located in Ojota and LASU Iba within 10km radius to a community. The conversion works include leveling of the refuse, slope stabilization, soil covering, grading as well as rolling and landscaping, rebuilding drainage and road network within and outside the site. Table 6 shows a WTE assessment of two large dumpsites.

**Table 6: Waste to Energy Assessment of two large dumpsites**

| Location | Ojota, Lagos | LASU-Iba road., Lagos |
|---|---|---|
| Capacity | 2,100,000 T/yr | 820,000 T/yr |
| Area | 43 hectares | 8 hectares |
| Residents | 5million in 10km radius from the site Proximity to Various industries | 200meters from the nearest dwellings, 4 4million people live within 10km radius Proximity to the General Hospital |

## 3.1 Utilization of Cement Kiln as Related to RDF in Nigeria

Cement industries in Nigeria use refuse derived fuels for production. It is practically impossible for a cement plant to achieve 100% recycling of cement kiln dust (CKD). Land filling continued to be the typically adopted mode of storage of CKD to accommodate the increased production of CKD. There are several efforts by cement industries to find practical applications of CKD due to high cost associated with the disposal and the strict environmental regulations for management and disposal. The re-utilization of CKD provides the opportunity to save higher quality natural materials, reduces the cost of disposal, freeing precious landfill space and great progress toward achieving 100% recycling scenarios being advocated by social environment policies. The first commercial use of CKD was reported in 1912, when it was used as potassium rich fertilizer for citrus and other crops. Besides the cases mentioned above, several researchers have investigated the reuse of CKD in a number of fields. However, as with other industrial waste materials, due to the large volumes of materials involved in highway construction, there has, and continues to be great interest in exploring the viability of using CKD in partial substitution of traditional construction materials. A number of researchers have investigated the use of CKD for subgrade sludge and as partial additive to produce blended cement for concrete construction. The first-generation cement plants in Nigeria are listed in table 7 and additional capacity between 2003 and 2008 (table 8). On-going cement plant projects are listed in table 9.

**Table 7: The first-generation cement plants**

| Companies | Date of establishment | Capacity of establishment (MT) |
|---|---|---|
| NIGERCEM | 1957 | 120,000 |
| EWEKORO | 1960 | 700,000 |
| BENDEL | 1964 | 150,000 |
| CALCEMCO | 1965 | 100,000 |
| CCNN | 1967 | 100,000 |

Source: Cement manufacturers Association of Nigeria (CMAN)

**Table 8: Additional capacity between 2003 – 2008**

| Plant | Year | Amount | Capacity (MT) |
|---|---|---|---|
| WAPCO (Ewekero) | 2003 | GBP 130 million | 1m |
| BCC Expansion (Benue cement) | 2004 | $400 million | 3m |
| Obajana (OCP) | 2006 | $1.2 billion | 5m |
| Ashaka Cement | 2008 | $150 million | 0.3m |
| Unicem (Calabar) | 2009 | $840 million | 2.5m |
| TOTAL | | | 11.8m |

Source: Cement manufacturers Association of Nigeria (CMAN)

**Table 9: On-going cement plant projects**

| S/N | Company | Plant location | Amount ($) | Capacity (MT) |
|---|---|---|---|---|
| 1 | Dangote group | BCC | 200m | 1m |
| 2 | Dangote group | Ibese | 1.02bn | 6m |
| 3 | Dangote group | Obajana expansion | 1.0b | 5m |
| 4 | Lafarge WAPCO | Lakatabu-Ewekoro | 600m | 2m |
| 5 | AVA Cement | Edo State | N/A | 0.2m |
| | Total | | | 14.3m |

Source: Cement manufacturers Association of Nigeria (CMAN)

### 3.2 Policy and regulations

Without legally binding requirements, the authorities will not be able to control compliance and to enforce high levels of environmental and public health protection, while plant operators will not have a clear framework in which to operate. Combustion of fossil fuels and biomass results in emissions of: carbon dioxide, carbon monoxide and particulates during calcination (the production of clinker from limestone). The National Environmental Standards & Regulatory Enforcement Agency (NESREA), a parastatal regulator under the Federal Ministry of Environment, enforces the discharge limits of such pollutants under the National Environmental (Non-metallic Minerals Manufacturing Industries Sector) Regulations (Federal Ministry of Environment, 2014). The Regulations set maximum permissible levels of airborne pollutants from various energy sources, including organic carbon (e.g. from burning biomass). NESREA is responsible for overseeing Nigeria's Extended Producer Responsibility, which bears directly on the use of bio-energy and other alternative fuels in the cement industry (Anukam, 2018).

Those environmental policies and regulations that do exist relate to air and water pollution from the mining of limestone, the transport of limestone to the cement factories and the control of local emissions, primarily Cement Kiln Dust (CKD). CKD contains limestone dust, dust from the combustion of other additives and particulates from biomass and other fuel combustion. If not captured, CKD can be dispersed over large areas and pose a serious airborne health hazard.

Emissions of other air pollutants (e.g. methane from natural gas transport and supply to the kiln, any other GHG emissions) are to be measured to ensure compliance with the National Environmental (Air Quality Control) Regulations (Federal Ministry of Environment, 2014).

## 4.0 Study Limitation

The study was mainly a desk review of country situation and did not involve physical visits to stakeholders.

## 5.0 Findings

- ✓ RDF usage in cement kilns is confirmed.
- ✓ Need to update the National Policy on Plastic Waste Management (2020) on the dangers of RDF on human health and environment.
- ✓ There is a general lack of data on imports and use of RDF.
- ✓ Before April 2019, most plastic waste flows between countries were uncontrolled under international law. Exporters only had to obtain prior informed consent from importing countries before shipping hazardous plastic waste
- ✓ The Nigeria National Policy on Plastic Waste Management has not addressed the issues of trade in plastic waste
- ✓ Combating the menace of plastic waste pollution has long become a global environmental challenge. Plastic pollution is capable of affecting land, waterways and oceans as a large percentage of marine and land creatures have died due to the fact that plastic is non-biodegradable and it causes hazards to soil and the entire ecosystem.
- ✓ Refuse derived fuels cover a wide range of waste materials which have been processed to different forms.
- ✓ Waste derived fuels include residues from MSW recycling, industrial/trade waste, sewage sludge, industrial hazardous waste, biomass waste, etc.
- ✓ The problem of waste management is continuously on the increase on a daily basis in Nigeria

## 6.0 Conclusion/Recommendation

- There is need for a campaign against the use of RDF in cement industries in Nigeria because of its adverse effect on the environment and human health.
- There is need for physical visits to stakeholders on the ground including cement manufacturers, Federal Ministry of Environment, Federal Ministry of Mines and Steel Development (MMSD), Nigeria Customs Service, and National Environmental Standards and Regulations Enforcement Agency, Standard Organization of Nigeria.
- Security architecture of the country borders should be strengthened to prevent importation of RDF.
- Government at all levels should enforce laws against the use of RDF in cement kilns.
- There is need for massive stakeholder awareness on the dangers of RDF use in cement kilns
- Aggressive advocacy on ban of single-use plastic with corporate and government MDAs supported with research on alternative materials and practices
- Recognize and integrate waste-pickers as municipal service providers
- Require disclosure on additives in plastics to end toxic recycling
- Regulation of the waste management sector
- Capacity building of Waste recyclers
- Capacity building of all relevant stakeholders including MDAs and industrialists

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