Published by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Source: Pixabay.com

GAP ANALYSIS OF PLASTIC WASTE RECYCLING VALUE CHAIN IN LAGOS STATE

Local Economic Development (LED), July 2021

Author: Nigeria Climate Innovation Center (NCIC)

Contents

Acronyms

EPR	Extended Producer Responsibility
FBRA	Food and Beverage Alliance of Nigeria
GPAP	Global Plastic Action Partnership-
HDPE	High Density Polyethylene
IFC	International Finance Corporation
LAWMA	Lagos State Waste Management Authority
LASEPA	Lagos State Environmental Protection Agency
LDPE	Low Density Polyethylene
LSDP	Lagos State Development program
MSW	Municipal Solid Waste
NCIC	Nigeria Climate Innovation Center
NESREA	National Environmental Standards and Regulations Enforcement Agency
PET	Polyethylene Terephthalate
PP	Polypropylene
PS	Polystyrene
PSP	Private Sector Partnership
PVC	Polyvinyl Chloride
RAN	Recyclers Association of Nigeria
R&D	Research and Development
rPET	Recycled Polyethylene Terephthalate
SDG	Sustainable Development Goals
SON	Standards Organization of Nigeria
VC	Value Chain
WEF	World Environmental Forum
WED	World Environment Day

Glossary of Terms

- **Plastic Recycling**: Separating, collecting, processing, marketing and ultimately using plastic that otherwise would have been disposed
- **Collectors**: Entities that collect recyclable waste and deliver them to processors for further processing
- **Landfill**: A specially engineered site for disposal of solid waste
- **Bioplastics**: plastics either partially or fully created with plants or other biodegradable components
- **Flaking**: the resulting small flat shaped pieces of material created when plastic is granulated
- **Baled Plastic**: A compacted and wire-bound cube or block of recyclable plastic
- **Shredding:** Process of cutting plastic into small pieces for granulation.
- **Resin**: These are synthetic materials used in making polymer plastics.
- **Gaps**: Absence of structures or needs in a sector, business or value chain that creates an opportunity for growth if bridged with the right resources.
- **Value Chain**: The key activities required to be performed before a product or service is produced
- **Ecosystem**: The aggregation of all participants within a specific sector contributing their efforts towards achieving similar goals in sustaining an objective in the long run.
- **Policy**: Regulatory adoption of actions designed to achieve a desired goal, which is driven by stakeholders

1. Executive Summary

The Plastic Recycling industry plays a significant role in the Nigerian economy bringing into perspective the volume of plastic consumed in terms of single use and plastic packaged products like soft drinks and other consumables.

Unfortunately, the indiscriminate disposal habits of plastic and public attitude towards consumption and disposal of plastic have led to thousands of tonnes of plastics littered around the environment on land and water ways. This has caught the attention of stakeholders to investigate sustainable solutions for curbing the plastic menace.

However, one of the viable approaches that has been recommended to mitigate this challenge is the process of recycling plastic to other products and adopting a circular system of consuming the plastic products.

SEDIN of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is committed to supporting Nigeria's efforts in improving and scaling the recycling ecosystem with Lagos State. SEDIN will achieve this by enhancing access to finance and business services, strengthening entrepreneurial and managerial skills, and ultimately addressing key barriers, gaps, and challenges along the plastic waste recycling value chain in Lagos State. This is steered towards sustaining the productivity and capacity of the plastic recycling ecosystem in boosting economic growth and income channels for households and communities; this is especially for women and the youth who are the primary target beneficiaries for this project.

The goal of this Gap Analysis is to identify key actors and players within the plastic waste value chain, identify their challenges and recommend interventions for capacity needs, with an outcome for developing the plastic waste ecosystem in Lagos State. This is further aimed at developing the plastic waste recycling industry by generating decent jobs, creating wealth in unserved and underserved communities while keeping the planet cleaner and more sustainable.

Key Information on the plastic recycling value chain exercise was gathered from various open sources, based on the survey instruments developed for the data gathering by NCIC. The Field Survey conducted through the administration of questionnaires is aimed at primarily understanding the plastic recycling value chain through both the informal and formal sector players which can be referenced for future strengthening of entrepreneurial and managerial skills development and access to market for new entrants and promotion, including attracting foreign direct investments (FDIs), and boosting the waste sector, including the involvement of institutional actors and stakeholders in Lagos State. The recommendations provided in the report will support SEDIN to make decisions that inform the development of the sector with major stakeholders, the Lagos State Government (LASG), development organizations, and business operating in the sector about major value chain development performances and policy proposals.

In terms of the findings of this project, analysis was conducted on the statutory history related to waste management in Lagos state, statistics, and secondary data from open sources, field research and interviews of stakeholders within the industry leveraging focus group discussions and in-depth interviews.

The main part of the report speaks to the activities along the value chain and the overall recycling scope in Lagos State with a focus on the recycling value chains in the plastic waste management sector, reviewing related legislation, the environment for doing business for recyclers, recycling businesses, and the trading activities within the sector. The report examines existing support measures for the recycling value chain and covers the developmental organizations' support, banking and finance sector and government policies. The second part examines value chain actors and how they complement each other to ensure productivity and possible market options for recycles plastics. The final part provides recommendations.

2. Introduction

2.1 Background on Lagos State

Lagos is one of the world's major cities and is the most populous city in Africa, ahead of Cairo. Lagos City in Lagos State is Nigeria's largest city and its economic capital. According to a 2014 report by the National Population Commission of Nigeria, Lagos is the 7th fastest growing city in the world, with a population of 21 million. Lagos is a MEGACITY, with a population of over double the required 10 million people!

Lagos State was created on May 27, 1967 by virtue of States [Creation and Transitional Provisions] Decree No. 14 of 1967 which restructured Nigeria's Federation into 12 States. The State is located on the South–Western part of Nigeria, on the narrow plain of the Bight of Benin. Lying approximately on longitude 20 42'E and 32 2'E respectively, and between latitude 60 22'N and 60 2'N, Lagos State is bounded in the North and East by Ogun State of Nigeria, in the West by Republic of Benin, and stretches over 180 kilometers along the Guinea Coast of the Bight of Benin on the Atlantic Ocean.

The state's mainly Yoruba population has grown more heterogeneous with the migration of other Nigerians and West Africans to Lagos city. Lagos state's agricultural and fishing output includes cassava (manioc), palm oil and kernels, coconuts, corn (maize), vegetables, fruits, and fish. These products are collected in the lagoon ports of Badagry, Epe, and Ikorodu and shipped to markets in Lagos city.

Unlike other states dependent on oil revenues Lagos City economy is diversified to manufacturing, transport, construction, service, wholesale, and retail sectors.Lagos is one of the most important cities in Nigeria and indeed in Africa, both economically and culturally. Its Geographic location is very significant, as it is on the Atlantic coastline of Nigeria allowing for excellent trade routes. It also has a major airport and is connected to other Nigerian cities via railway and road links.

Lagos state covers only 0.4% of the Nigeria's land yet is highly important to the country. Lagos in 2017 had a GDP of over $136 billion in 2017, accounting for over 60 percent of industrial and commercial ventures of Nigeria. A 2015 report by the Economist states that annually Lagos State generates $90 billion dollars in goods and services.If Lagos were to be a country its economy would be number 7 in Africa making it bigger than that of Kenya, Cote D'Ivoire, and Ghana.

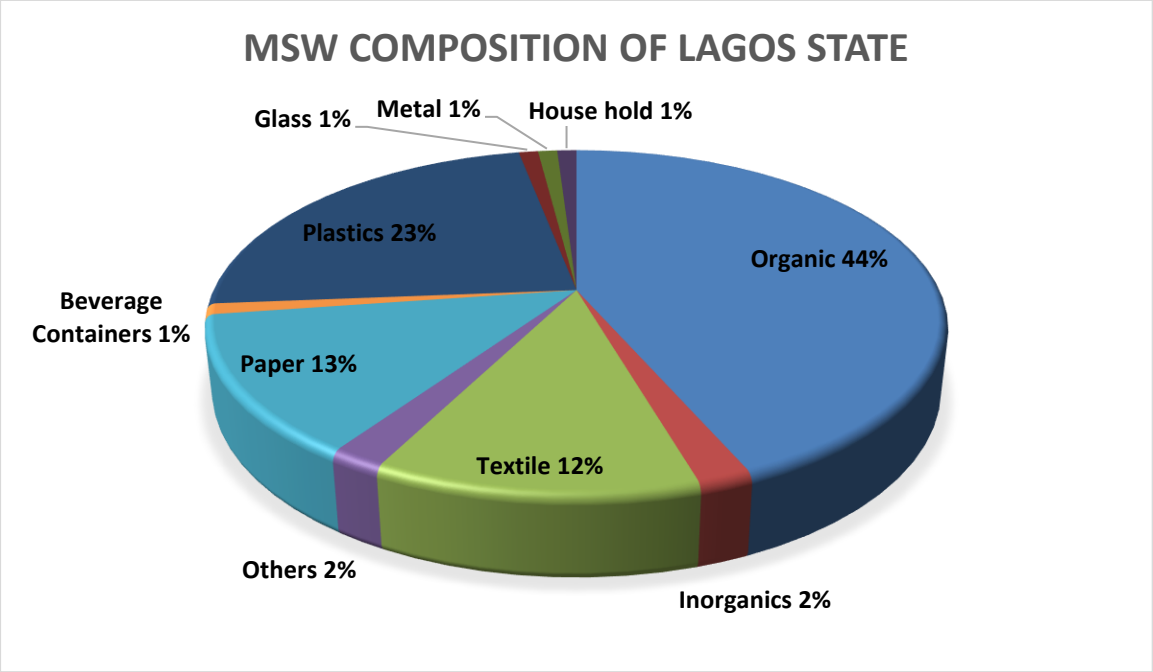
Figure 1: Map of Lagos State: Source- Wikimedia Commons 2020

2.2 Waste Generation Outlook of Lagos State

It is often argued that Lagos State is a victim of its own achievements especially in the areas of rapid urbanization and infrastructural development which inturn attracts ceaseless migration into the state, contributing to the challenges of high poulation rise and pressure on the limited resourses available in Nigeria's smallest state by landmass. As the country's commercial hub, with an estimated population of 22 Million, Lagos houses about 2,000 Industrial complexes, 15,000 commercial ventures and a bourgeoning middle class with high purchasing power.

According to the World Bank, the generation of waste is tied to population, income and urbanization. If the report by this body which puts per capita waste generation rate at 1.2 kg per person per day is anything to go by, waste generated in Lagos far outweighs the official figure of 13,000 tons per day. Also, the fact that the per capital waste generation has been projected to rise to 1.42 kg in the next fifteen years presents a serious cause for concern.

Figure 2: The composition of municipal solid waste (MSW) in Lagos can be categorised below:



Source: LAWMA

Waste collection and transport is the responsibility of the Lagos State Waste Management Authority (LAWMA). Waste collection from households is carried out by Private Sector Participants (PSPs). PSPs emerged in the early 2000s as a way to engage and encourage private sector participation in waste management. In many instances they were local SMEs emerging out of the informal sector. Under the arrangement, PSP operators had access to government financed schemes that allowed them to take out loans for the purchase of waste collection equipment and pay back the costs gradually from the proceeds of their business. LAWMA's responsibilities were reduced to coordination of the PSPs; cleaning of public areas, public institutions and schools; management of transfer loading stations; and oversight of the dumpsites in the state.

As a result of the huge volume of waste generated in Lagos State , The Lagos State Government through LAWMA has launched the Lagos Recycle Initiative which is tailored towards primarily tackling the challenges of plastic waste pollution in the State as well as creating waste management reward system for resdents of Lagos State.

2.3 Actors and Agencies in Lagos State Waste Management/ Legislation

The table below shows the agencies involved in the waste management of Lagos State.

Table 1:

Instiutions	Primary Roles Associated to Waste Management
Federal Ministry of Environment (MoE)	• Issue waste legislation and policy guidelines at the federal level • Develop a Solid Waste Management Master Plan • Provide Technical Assistance to States and LGA's
National Environmental Standards and Regulations Enforcement Agency (NESREA)	• Enforce compliance with environmental laws, guidelines, policies and standards • Conduct environmental audits • Create public awareness and provide environmental education
State Government	• Issue waste legislation and policy guidelines at state level • Provide financial instruments for private sector participation (PSP) Provide land for Solid Waste Management activities
Lagos State Environmental Protection Agency (LASEPA)	• Advise the State Government on all waste management policies • Carry out awareness campaigns on sound waste management • Monitor waste management and environmental degradation in Lagos State
LGA's and LCDA's	• Formally responsible for waste management in their respective areas.(but in reality, in Nigeria the waste is managed at state level) • Ensure that the waste is properly collected in their areas.
Private Sector Participants (PSP's)	• Collect, transport, and dispose of the waste in a designated area • Collect the waste fees from the citizens
Informal sector	• Collect and trade recyclables from households, along the street and from dumpsites

Legislation on Waste Management in Lagos State include:

Table 2:

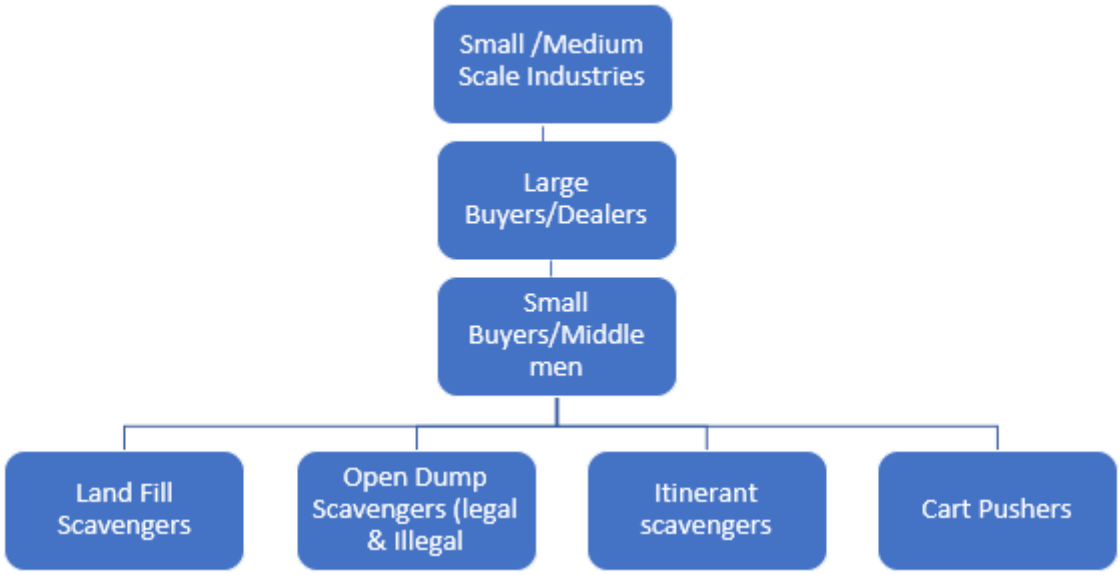
Law/ Regulation	Year	Description/Significance
Lagos State EPA Law	1996	Establishment of the Lagos State Environmental Protection Agency. LASEPA monitors and controls waste disposal in Lagos State and advises the State Govt on environmental management policies
Lagos State Environmental Sanitation Law	2000	Requires the State citizens to clean their property on the last Saturday of the month
Lagos Waste Management Authority Law	2015	Legal basis for the establishment of the Lagos State Waste Management Authority (LAWMA)

The first step in waste management in Lagos State is to evaluate and identify the diffrent types of waste being generated in order to design appropriate collection and disposal strategies. The largest proportion of waste in Lagos metropolis can be composted rather than disposed of. A heap of discarded papers that is meant to undergo some processing can be turned into toilet tissues. In the same manner old and broken glasses and bottles can be utilized in the manufacture of new glassware. Metals too can be recycled to scrap metals. Likewise nylon can be recycled, so as to minimize the problem of indiscriminate disposal of polythene products in drainages. Efforts should be made by stakeholders to evolve policies for disposal, recycling and ultimately zero waste situation.

3. Plastic Waste Recycling Ecosystem of Lagos State

The gaps and challenges within the plastic waste value chain in Lagos State can be better categorised by understanding the plastic waste recycling eco-system which is broken into two major parts- the informal and the formal sector as discussed below:

Figure 3:



Source: ResearchGate Publication 2021 (Nzeadibe and Iwuoha)

Scavengers or waste Pickers:

In Lagos the waste pickers or scavengers can either be male or female ranging from ages of 10-70 years. These scavengers work in different areas across Lagos from Ojota landfill site to other legal open waste dumps in Solus and Abule Egba. About 2,500 to 3,000 scavengers work at the Ojota landfill which is estimated to accommodate about 70% of the total waste generated in Lagos state. These waste pickers have been the job for about 1-16years and are majorly uneducated. Some waste pickers however work at illegal dumps scattered around the city. There are also itinerant scavengers who go about the streets of Lagos, picking recyclable materials from residential areas.

- The scavengers that operate at the landfill site
- The scavengers at both the legal and illegal waste dumps
- The itinerant bottle and can collectors (locally known as "*onigo*")
- The cart pushers (locally called "*kole kole*").

The plastics recovered by these groups of people include discarded cups, plates, containers, bottles, chairs, buckets, PVC pipes and plastic water containers. Different types of flimsy plastic packaging materials popularly called "nylon" are also recovered for recycling at a factory near Ojota landfill site, where they are converted into pellets or such products as car bumpers, car mirror holders, rubber slippers and shoes, plastic buckets, plates, and cups.

Small buyers/Middle Men:

At the next level on the hierarchy are the small buyers/middlemen. They buy materials directly from many of the waste pickers depending on the type and specification. There is a form of specialization in the recyclables they deal in. There are "dedicated" scavengers who recover and sell particular types of plastic materials to this group. The small buyers/ middlemen also have a personal relationship with scavengers that recover materials of their interest. The small buyers/middlemen operate as a cartel making it almost impossible for new entrants to come into the business while also fending off competition.

Large buyers/Brokers:

Above the small buyers on the hierarchy are the large buyers/brokers. These people operate on a large scale, buying from many small buyers/ middlemen. They have large capital outlay and sell directly to the relevant industries. Sometimes they have contractual agreements with the small buyers/middlemen who gather and supply materials in order to assure the supply of an adequate volume and quality of materials .

Small and Medium Scale Industries:

The small and medium scale industries that finally recycle these materials rank highest on the informal recycling hierarchy. They deal directly with the large buyers/brokers due to the huge capital requirements and the need to supply recyclable materials to specification. These industries are very important because they largely motivate and finance the recovery and recycling of these recyclable materials.

Table 3: Average quantity of recovered materials in tonnes

Scavenger group	ferrous metals	glass bottles	non-ferrous metals	plastics	tyre	paper	nylon	Total
Ojota landfill site	81.82	71.12	60.96	91.44	50.8	60.96	91.44	508.54
Solus/Abule-Egba dumps	50.8	60.96	50.8	81.28	30.48	40.64	60.96	375.92
Itinerant scavengers/Cart pushers	40.64	91.44	81.28	40.64	5.08	20.32	5.08	284.48
Total	173.26	223.52	193.04	213.36	86.36	121.92	157.48	1168.94

Table 4: Recyclable waste in Lagos State and their applications across various markets and players

Recyclables	Markets	Uses
Metals	Blacksmiths, artisans, welders, iron/ steel markets, metals/steel companies, etc.	Used for metal gates, pots, plates, cooking utensils, cutlass, hoes.
Glass bottles	Bottling, pharmaceutical, wine, breweries, cosmetics companies, market women	Soft drink and beverage, peanut bottling, herbal remedies, domestic uses
Plastics and Nylon	Plastics companies	Rubber slippers, shoes, cups, plates, chairs, buckets
Tyre	Auto mechanics, vulcanizers, abattoirs individuals, polish factories	Tyre repairs, shoe polish, domestic uses, roasting of meat
Paper, old cement bags and sacks	Toiletry companies, market women, householders	Toilet paper, sacks, building of houses, packaging
Construction and demolition waste/ battery casing	Construction companies, Scavengers, lead for battery companies	Building of houses, making lead batteries
Jewellery	Jewellery sellers, goldsmiths, scavengers, individuals	New jewellery ornaments
Clothes and Discarded shoes	Scavengers, cobblers, shoe companies	Reuse of clothes, making of new shoes
E-waste	Ikeja Computer Village	Reused in the repair of computers and mobile phones

Source: Researchgate publication 2021

3.1 Plastic Waste Recycling As a Potential Venture for Lagos State.

Plastic is an affordable and convenient packaging material in Nigeria and there are no current laws or legislations regulating its usage. This has caused a huge utility level for the product from plastic bags used for carrying items to drinking water (both in plastic and sachet)and beverages, among other locally processed items for consumption on a daily basis. This factor has characterised plastic usage as a product prone to high environmental pollution if disposed inappropriately. Unfortunately, due to bad disposal habits, most of these plastics at post consumption become pollutants that end up in waterways,drainages, gutters and litered all over the cities and suburbs.

In the past thirteen years the per capita consumption of plastics in Nigeria has grown by about 5% annually from 4kg in 2007 to 6.5kg in 2017. It is estimated to be 7.5kg in 2020.

In Lagos State, plastic waste is seen as a huge source of environmental pollution . Lagos generates an estimated 6 million tons of waste each year, of which 23% is plastics, making 1.38 million tons of plastic waste per year or 3,800 tons per day of which only 12% of it is recycled. The unrecycled plastic usually ends up in landfills, waterways, drainages, streets, and bushes. This leads to flooding and other environmental hazards.

As of 2019 about 2,250 tons of plastic waste are generated on a daily basis. From a commercial viewpoint of selling a ton for USD 500 and if only 500,000 tons of plastic can be recycled and reused annually, it will potentially be a USD 250 million industry in Lagos State.

Plastic waste collection is done on different levels - scavengers, landfills, home collection, street cleaners, and at corporate entities. Informal workers commonly referred to as scavengers carry out plastic waste collection across the city from dumpsites, streets, drainages, roads and sell it to bigger players along the value chain such as RecyclePoints, Scrapays, Wecyclers and others in exchange for cash, groceries, household items amongst other needed items. Waste collection companies also pick up in their respective LAWMA designated areas from homes, street cleaners and business establishments. On average 80 tons of waste per month is collected. The collected recyclables are further managed at collection and sorting centers owned by the waste collection companies and thereafter the waste materials are sold to manufacturing/recycling plants for further processing.

3.2 Types of Plastics Collected for Recycling in Lagos State

Plastics are found in different forms and categories , with their unique features, characteristics, and composition. Research has shown that there are more than 100 types of plastic but in Lagos, only six types and generally found and collected for recycling purposes as mentioned below:

1. Polyethylene Terephthalate (PET): This is a general-purpose thermoplastic polymer which belongs to the polyester family of polymers. Recycled PET can be converted to fibers, fabrics, sheets for packaging and manufacturing automotive parts. PET is highly flexible, colorless, and semi-crystalline resin in its natural state. Depending upon how it is processed, it can be semi-rigid to rigid. PET is resistant to impact, moisture, alcohols, and solvents.

2. High Density Polyethylene (HDPE): This is a thermoplastic polymer made from petroleum and used in a wide variety of applications, including plastic bottles, milk jugs, shampoo bottles, bleach bottles, cutting boards, and piping. It is known for its outstanding tensile strength and large strength-to-density ratio, HDPE plastic has a high-impact resistance and melting point.

3. Low Density Polyethylene (LDPE): This is a soft, flexible, lightweight plastic material and is used in the creation of dozens of common products. It's used to make plastic shopping bags like those provided by grocery stores and other retailers. LDPE can also be used to make plastic bread bags, food wrappings, squeezable bottles, and tops for plastic containers such as margarine tubs. Cereal bags, garbage bags are other examples of products that are commonly made from LDPE. Unfortunately, it is difficult to recycle and most of this type of plastic ends up in landfills.

4. Polyvinyl Chloride (PVC): Polyvinyl Chloride (PVC or Vinyl) is an economical and versatile thermoplastic polymer widely used in building and construction industry to produce door and window profiles, pipes (drinking and wastewater), wire and cable insulation, medical devices, etc. It is the world's third largest thermoplastic material by volume after polyethylene and polypropylene.

5. Polypropylene (PP): This is a low density, but tough, rigid, and crystalline thermoplastic produced from propene (or propylene) monomer. It is mainly used in the sectors like the automotive industry, industrial hardware, consumer goods, and furniture market.

6. Polystyrene (PS): This is a naturally transparent thermoplastic that is available as both a typical solid plastic as well in the form of a rigid foam material. PS plastic is commonly used in a variety of consumer product applications and is also particularly useful for commercial packaging.

Table 3: Plastic Analysis for Recycling Potential				
Plastic Category	**Abbreviation**	**Characteristics**	**Key properties**	**Recycling Potential to other Products**
Polyethylene Terephthalate	PET	• highly flexible • Colorless • Semi-crystalline	• It is recyclable and transparent to microwave radiation • PET doesn't not break or fracture • PET is safe for contact with foods and beverages	• Fiber for carpet, fleece jackets, comforter fill, and tote bags • Containers for food, beverages(bottles), and non-food items • Film and sheet • Strapping materials
High Density Polyethylene	HDPE	• Durable • Versatile • Low cost • Abrasion and chemically resistant plastic material	• High density	• Recycling bins • Plastic lumber – used for playgrounds, picnic tables, and outdoor patios • Pipes • Non-food bottles, for example, anti-freeze bottles, as well as bottles for motor oil, laundry cleaners, cleaning products, conditioner, and shampoo • Hardscape materials, flower pots, and gardening tools • Floor tiles • Sheeting and film plastic • Crates
Low Density Polyethylene	LDPE	• Impact strength • Chemical resistance • Low gravity (light) • Poor heat resistance • Very low stiffness and strength	• Low density	• Shipping envelopes • Panelling • Rubbish bin liners • Furniture • Film plastic • Rubbish bins and compost bins
Polyvinyl Chloride	PVC	• Difficult to melt • Low cost • Flexible & high impact strength • Light weight	• High insulating tendencies	• Baby dishes and utensils • Bags for textiles (bedding) • Blister packs and clamshells containers

		• Durable • Low Cost		• Decking • Faux leather products - shoes handbags, briefcases • Food shrink wrap • Medical equipment – tubes • blood bags • Pipe • Toys • Vinyl flooring • Vinyl siding • Window frames • Wire insulation
Polypropylene	PP	• Translucent • Chemical resistance • Tough • Good fatigue resistance • Integral hinge property • Heat resistance	• Rigid and crystalline	• Dishware • Clothing fibers • Food containers • Industrial fibers • Speed humps • Compost bins • Gardening equipment
Polystyrene	PS	• Clear • Rigid • Moderately strong	• Naturally transparent	• Packaging materials • Seating and insulation in cars • Box packaging • Floor, wall and flat roof insulation

4. Plastic Waste Recycling Value Chain in Lagos State

4.1 Key Value Chain Actors

Waste Generators (House Holds, Commercial Centers,Industries, Others):
This category of actors are majorly plastic product consumers who utilise items or consumables packaged in plastic materials and disposed off at the point of post consumption. The question of pollution lies within disposal habits of comsumers along the consumption chain which data has shown to be very poor hence, the plastic pollution that stares at Lagos State.

Waste Pickers (Informal waste sourcing):
These category of people are the least talked about and the unsung heroes of the plastic recycling value chain, considering that their contributions are immensely invaluable. This could be owed to the fact that this sector is majorly informal and not structured. However, these catergory of actors are very dogged and resiliant in their ability to source for waste from house holds, industries among other waste generating sources.

Collectors/Aggregators (Plastic collection and storage):

The collectors receive the plastic waste from the pickers in exchange for valuables or negotiated pre-agreed pricing rates. However,collection is dynamic and subject to the collection model adopted by the collection company. Some collection companies collect the plastics before they are disposed off, which means, -collection at source. This is achieved through partnership arrangements with entities prone to high plastic consumption like restaurants, hotels, social and commercial centers. At this point, the difference between a collector and an aggregator is the volume of plastic collected. An aggregator collects and stores huge commercial volumes while a collector might simply have enough plastics to meet small retail demands.

Pre-processors (Sorting and Separation):

The pre-processesors are tasked with the responsibility of sorting, and bailing of the collected plastic waste. Baling is done to densely reduce the volume of plastics collected and transport - ready for further processing while sorting requires separating the diffrent categories of plastic, for example, bootle caps will be separated from actual bottles. According to experts playing in the plastic recycling space in Lagos State, the transparent bottles and the blue coloured plastics are more profitable than the regular plastics collected.

Processors (Washing, Shredding, Flaking)

The processors are the gateway to the end users (recycling companies) as their primary function is to convert the collected baled plastic from pre-processing companies and convert the plastic into hot washed flakes (recycle-ready materials) through hot washing, shredding, flaking including other complex processes and sell to recycle companies for convertion to other plastic products.

Recycling Companies (Conversion to finished plastic products):

The recycling companies are the end users of the entire chain beacuse they end up with the processed plastic which they inturn convert into several plastic products like plastic chiars, tables ,cutlery, including other house hold items that are peculair to the demands and needs of the markets they serve in Lagos State.

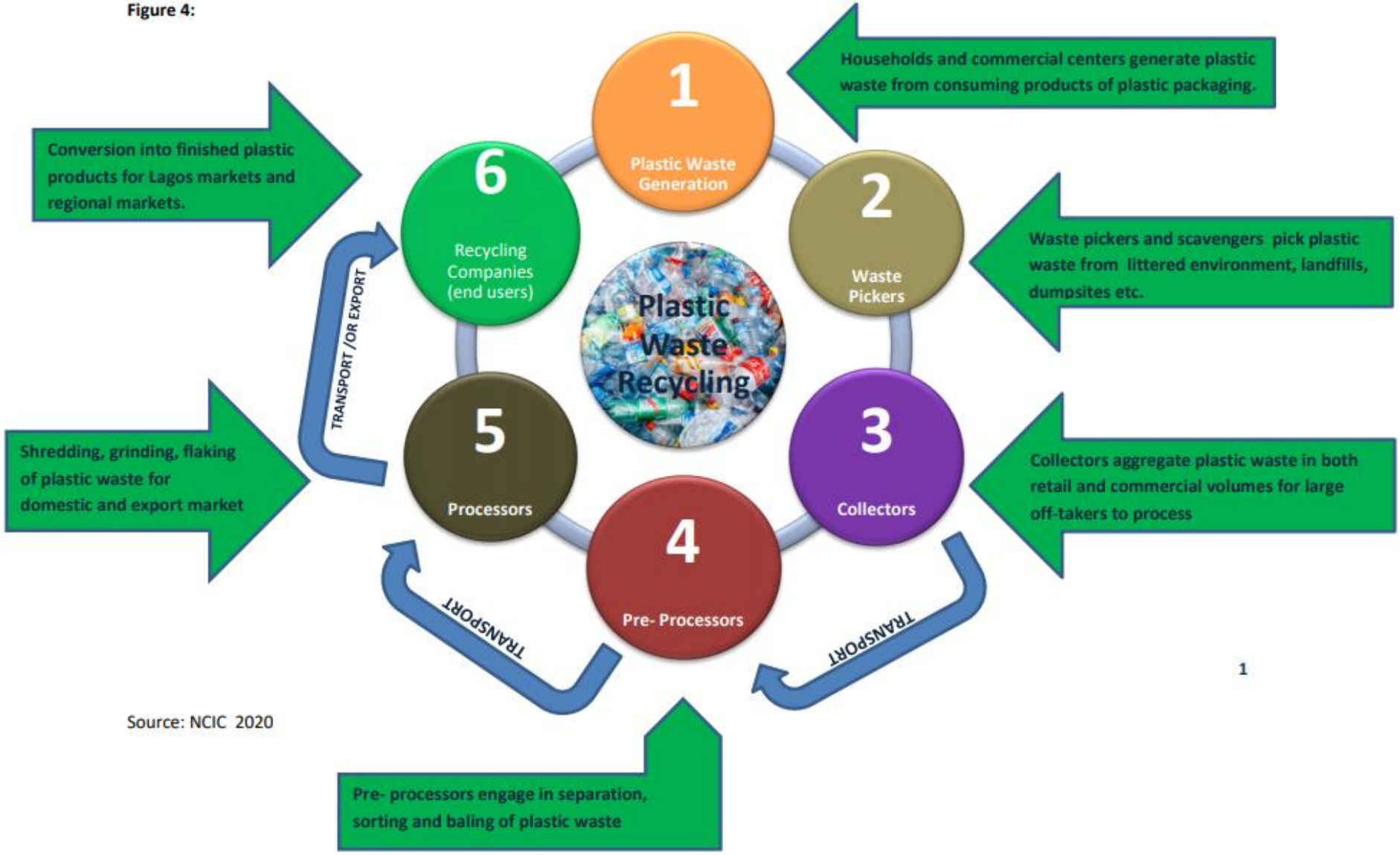
Transportation and Logistics (Moving plastic waste along the value chain to end users):

This is a very vital aspect of the plastic waste recycling value chain as the services of transporters in the form of trucks or improvised mobile tricycles are required to move baled plastic waste from the pre-processors along to other actors of the value chain for further processing.

In addition, waste generated from recycling plastic like waste water, PE and PP are redeployed back into the production chain to create a circular production system. At the point of sorting, labels on bottles are seen as non commercially viable as there isnt a market for such plastic labels in Lagos state . However, if aggregated to a large quantity, these labels are creatively used by some recyclers as pillow stuffings used in their hubs or offices. The plastic recycling value chain highlighted above can be disrupted by innovations especially through smart-tech related solutions aimed at making the value chain more efficient and attractive for more players to unlock opportunities and bridge identified gaps and challenges . For example, in Lagos there is a smart waste App called PAKAM aimed at connecting recyclable waste products to recyclers,while also connecting communities to waste agencies at real time, among other smart waste management services. By virtue of the huge plastic waste deposits in Lagos, there is room for entrepreneurs, innovators and solution providers to identify areas within the value chain where they can add value and create wealth through employment and job creation especially for women and the youth accross Lagos State.

4.2 Illustration of the Plastic Waste Recycling Value Chain in Lagos State

Figure 4:

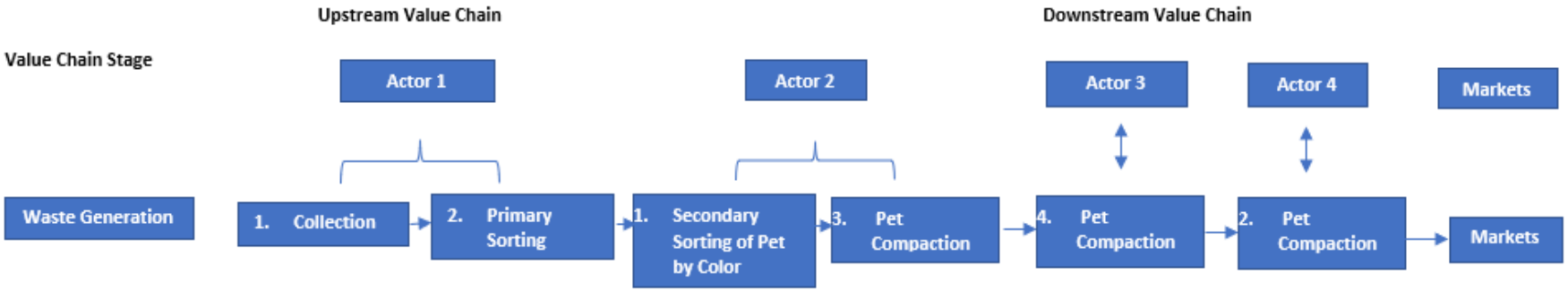


Source: NCIC 2020

4.3 Gaps and Challenges of Key Players in the Plastic Waste Recycling Value Chain in Lagos State

The VC chain is very dynamic and subject to business models adopted by the players and the different markets they occupy. However, the processes for recyling are pretty much thesame or similar from collection to end user along the plastic waste recycling VC. Another illustration of the VC could take the flow illustrated below:

Figure 5:



Source: wastelessfuture 2016

In order to have a detailed understanding of challenges and possible solutions to bridge the value chain gaps, interviews and indepth discussions with some key players within the plastic waste recycling value chain in Lagos State played a huge role at enabling NCIC derive the following information. It is also important to note that some of the players within the value chain have similar or identical challenges. Some of the key challenges and gaps experienced within each segment of the value chain include the following:

Value Chain Actors	Key Challenges/Gaps Per VC Actor	Solutions	Outcome
Waste Pickers	• Informal and unstructured working system • No structured compensation model • Vulnerable to health risks • Absence of adequate working gear • Lack of Education and capacity building initiatives	• Lagos state to have a formal waste recovery program • Standardize plastic waste pricing through unions or associations • Medical insurance for waste pickers • Regulation on proper working gears • Training on waste management skills and basic education	This will help the waste pickers with basic skill aquisition around waste management, while being protected during work hours and

			rewarding incentives that are comensurate to the amount of work they put in.
Collectors/Aggregators	• Storage space • Supply chain gaps	• Lagos State to provide designated storage hubs for collectors to improve colection capacity.	This will provide a more efficient working environment with the required resources to meet demand upon requests from other VC players.
Pre-processors	• Transportation and logistics • Space for business operations • Demand to supply gaps • Extortion from hudlums • Funding • High cost of equipment • Power supply	• Ownership of loading trucks as opposed to one off services • Lagos State to provide designated storage hubs • Dependent upon consumption of plastic related products • Proper regulation to secure storage space intergrity • More impact investment involvement around the VC • Subsidies through OEMs in partnership with Lagos State • Off-grid clean solutions to power plants	It is more cost effective for pre-processors or any player within the value chain to own their own transportation when compared to hiring trucks for one off pick ups and drop offs. Transportation takes away over 70% of the burden or gap experienced during daily operations for this VC segment. Power and machinery are subject to the funding capacity of the business to be more effective and effeicient in sourcing alternatives to these gaps (as recommended in the solutions column).
Processors	• High cost of equipment	• Access to funding for equipment purchase by both state and	Funding will go a long

	• Access to funding • Logistical challenges	private investors, including transportation and other logistical gap resources.	way in enhancing the productivity of processors due gto the heavy equipment needed at this stage of the value chain.
Recycling companies	• Supply gaps • High cost of equipment	• Create partnerships around logistics with processors to reduce or mitgate supply gaps for processed plastics. • Access to funding for equipment purchase by both state and private investors, including transportation and other logistical gap resources.	Collaborations with other VC players will create a seamless work flow and mitigate logistical or operational gaps like insufficient raw materials to meet market demand or delays on meeting timelines.
Transporters	• Low demand for services due to high charging fees by transporters.	• Competitive and affordable pricing to improve patronage and productivity along the VC.	Transportation is a highly demanded service along the value chain and if utilized effectively via ownership, would go a long way in improving the productivity of each player.

Further evaluation on the gaps and challenges along the value chain from industry experts interviewed include the following key inputs:

1. **Transportation and logistics problems**: This challenge has been a thorn in the flesh for players along the value chain especially at the pre-processing stage where baled plastic waste is transported to processors for further processing. The primary challenge here is the high cost of transportation as service fees charged by drivers or truck owners/leasing companies. According to an expert review, some drivers could charge as high as N80,000 within Lagos State to transport plastic waste . Paying such high service and transportaion fees is counter-productive as it increases operational cost and reduces profit lines significantly.

   Secondly, most trucks are unable to get to certain areas within Lagos state due to bad road conditions and unaccessible collection points. Some roads are too narrow for trucks to access and the distance between collection points and the trucks could be too far. In such instances, manual labour is employed which adds to the cost of transportation and makes the entire process less efficient. In addition, the cost of maintaining these trucks are very high.

   However, some value chain actors transfer the cost of transportation to the demand chain by creating a model where collection is done at source by large recycling companies who often times own their own trucks or have the financial capacity to cover transportation cost without affecting their profit lines.

2. **Holding Space or Working Space**: Recycling plastic waste especially at the pre-prossing stage requires holding space where plastic waste retreived from collectors are aggregated for sorting , separation and baling. The amount of space owned and utilized by a plastic recycler determines the volume of plastic that be collected and processed ,and that affects the productivity levels of the entire value chain if space becomes a constraint. The disadvantage of this constraint is the creation of supply-demand gap where supply cannot meet demand from large processors and end users.Another space related challenge is the issue of hoodlums who often sometimes extort space owners for unjustified fees supposedly meant for some sort of entitlement or ownership rights of working space used by these recyclers for their daily operations.

3. **Health Issues**: Plastic waste recycling is associated with numerous health risks along the entire value chain. This is owed to numerous factors from collection and scavenging sources at dumpsites or land fills, even though some collection models are structured to retreive used plastic before they are disposed. Those players at the informal segment of the chain are prone to alot of health hazards because of their daily exposure to littered environments.

   Another health concern is the manual intervention employed during sorting and separation of plastic waste before the baling process starts. According to expert views, this process is a painstaken task and highly physically demanding with long standing hours depending of the types of plastics collected and volume. However, there are automated plastic sorting machines which are averagely priced at N20 Million and cannot be afforded by all recycling ventures.

4. **High Cost of recycling machines and equipment**: Recycling if done properly is a capital intensive venture depending on what part of the value chain you belong to and the volume of plastic recycling aligned with the business model. These equipments are required to operate with precision, speed and effeciency to reduce manual intervention and increase productivity. How ever, operational challenges do occur where machines breakdown adding to cost of operation.

5. **Access to funding**: Finance is a critical factor for scaling any venture and the recyling business which revolves around machines capable of pressing,blowing, shreding, flaking, washing,sorting, melting, baling, extruding, pelletizing among other complex processes require capital. For example, each of these processes require an equipment to perform their corresponding funtions. The prices for these machines could be averagely tagged from $50,000-$100,000. Unfortunately the sector does not receive the expected funding it deserves as expressed from expert views and that reduces the capacity of most plastic recyclers to operate optimally.

6. **Lack of Power Supply**: This is a national challenege that affects businesses at all levels. According to an expert view, high electric tarrifs with unstable power supply affects business operations especially equipment that is run on electric power to funtion. Some recyclers have to convert their electrically driven machines to mechanically driven ones which is an expensive process and continues to incur costs. The use of diesel which is not eco friendly to power generators is also expensive at about N300 per litre. This is not sustainable without adequate working capital to cover your cost from profits made in the long run.

7. **Knowledge Gap**: Understanding the ramifications of plastic waste and its effect to the environment will go a long way in addressing consumption and disposal habits of plastic packaging products accross the spectrum of waste generating groups like house holds and other individual or commercial sources. In achieving this, plastic packaging will be better disposed through advocacy from a young age by innovatively engaging schools as practiced by Wecyclers to expose young kids to environmental responsibility. The Lagos State Commissioner for Environment and Water Resources, Mr. Tunji Bello, said government will also put in place a strategy for identifying and disseminating sustainable plastic waste management knowledge to the public and other stakeholders in user-friendly formats. In addition, he also said the state will incorporate sustainable plastic waste management knowledge into government implemented public awareness initiatives.

5. Building Circularity in Lagos State through Plastic Waste Recycling

5.1 Circularity to Address Plastic Waste Pollution in Lagos State

It has been reported that if we do not rethink the way we use plastic globally, there will be more plastic in our oceans (by weight) than fish by 2050, with 8 million tonnes leaked into the ocean every year.

Adopting circularity as a collective habitual responsibility and economic model would to a large extent address plastic waste polution in Lagos State as well as recycling habits through reusing plastic packaging by consumers especially in households. In a way, the circularity concept has since long been adopted by the informal sector, a significant chunk of the economy. Examples are the re-use of plastic bottles for local, home-produced drinks, and used wine bottles for packaging of roasted groundnuts, and other snacks.

Circularity stands a chance to succeed when there are companies along the various parts of a value chain that will work to reduce output and re-use whatever is still produced. Nigeria houses many large producers, especially in Lagos and Ogun, that can and should play an important role in circularity. They are supported by collection and recycling companies. Often 'home grown', these companies are increasing in capacity thanks to the support of knowledge institutions and of course, by receiving the necessary funding to scale.

The Food and Beverage Recycling Alliance was established in 2013 as the producer responsibility organization (PRO) for the food and beverage sector with a focus on enabling the collection, recovery, and recycling of the post-consumer packaging waste (mostly plastic) in compliance with the extended producer responsibility guidelines. The alliance currently has some of the largest food and beverage companies in Nigeria as its members such as Nestle Nigeria, Nigerian Breweries, Coca-Cola Nigeria, Guinness Nigeria, Omnik Limited, Engee PET amongst others.
FBRA also has collection partners such as Recycledge, RecyclePoints and several others.

The new plastic economy envisioned for Lagos State takes into cognizance the principles of circular economy which are to preserve and enhance natural capital; optimize resource yield and foster system effectiveness. Emphasis is based on producing biodegradable plastic which help decouple plastic from fossil fuel as these conserves non-renewable fossil fuel. Biodegradable plastic produced after optimal use decomposed to produce fertilizer that will be used as nutrient for the soil. By promoting re-use, recovery, and recycling of plastics to keep component and materials circulating in the system and contributing to the economy allows for energy preservation as a result of reduction in the quantity of virgin plastics produced. Waste is designed out by re-use, recovery and cleaner recycling thus reducing the amount of solid waste going to the landfills and the emission of gases like carbon dioxide into the atmosphere.

A circular reuse approach could take form of the illustration below alongside its benefits for a state like Lagos:

Figure 6:

Source: MacArthur Foundation

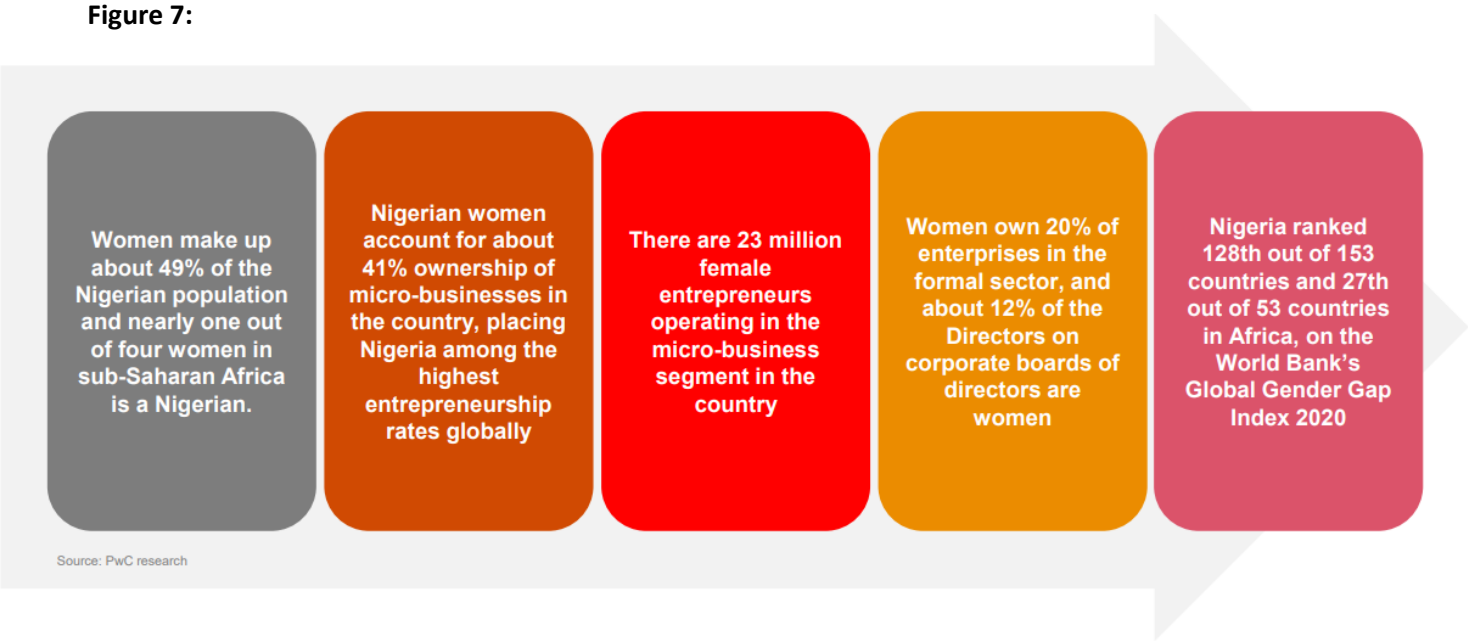
In addition, Lagos state in July 2021 through LASRIC flagged off an initiative to encourage circular innovators in the state via grant financing of N5 Million to develop sustainable solutions towards promoting circularity as a waste management mechanism tailored towards a more sustainable economy ,while creating opportunities and green jobs targeted at Women and the youth as an outcome.

5.2 Plastic Waste Recycling as a Tool for Empowering Women (SDG-5) and the Youth in Lagos State.

Nigeria's population estimates are almost evenly split between the male and female members of society. Yet, Nigeria ranked 128th out of 153 countries and 27th out of 53 countries in Africa, on the World Bank's Global Gender Gap Index 2020 – which implies that the country still has a way to go to attaining gender equality and equal representation for women.

In order to justify the need for female empowerment through employment and job creation, it is important to profile the potential of a Nigerian Woman as illustrated below:

Figure 7:



Today, the unemployment rate in Lagos State according to the National Bureau of Statistics is about 17%. Leveraging Plastic Waste Recycling can be a viable source for creating and generating jobs especially for women in Lagos State. There is a huge collection gap in the plastic recycling value chain and that can be bridged by creating a highly incentivized but sustainable model through public and private sector partnership between the Lagos State Government and already existing plastic recycling companies.

According to estimates from expert views, an average of 5,000 to 10,000 jobs can be generated in Lagos State through the plastic waste recycling value chain dedicated in empowering women to have decent jobs while impacting the environment positively. This is realizable with respect to the huge plastic deposits in the state and the potential it portends if collected and recycled properly. It has been proven numerously that women can dynamically play across the VC and compete favorably with their male counterparts.

In a clearer context from studies taken, the plastic waste industry in Lagos is valued at over $200 Million and less than half of this value has been tapped . That leaves a huge vacuum for expansion, diversification, export among other opportunities and these indicators require jobs to actualize them which can be categorized as decent and rewarding for women across the State and tackle unemployment challenges among the youth population of Lagos State.

Investments targeted at female entrepreneurship in plastic recycling will help in diversifying the sector into other innovative steams like the arts . Today we have sustainable art where plastic waste of all forms is used to create artworks like portraits , including plastic jewelry for fashion. An example is the viral story of Adejumoke Lasisi (Founder Planet3R) who made the portrait of the Oni of Ife with used pure water sachet and plastic straws.

5.3 Level of Female Participation in Plastic Waste Recycling in Lagos State

Female participation along the plastic waste recycling VC in Lagos State has essentially been a function of initiatives created by recycling companies in partnership with state government and other private sector players alongside corporate organizations driving plastic recycling as a tool for empowering women and youth especially in underserved rural communities.

Along the value chain, scavenging and waste picking is a male dominated sector which is essentially due to the rigorous and physical nature of the job as well as health risks associated with it. However, there are pockets of female scavengers who engage in the sector.

Women are more active around the collection and processing segments of the VC. This is owed to the fact that there have been a lot of disruptive and inovative collection models which are targeted towards gender inclusion in these sectors. These models include incentive based collection models where plastic is exchanged for cash, points and household items, including franchising models to collect plastic waste on behalf of recycling companies.

Women are also active along the pre-processing stage where sorting and separation takes place. Interestingly, women hold leadership positions at managerial and decision making segments of the VC as CEOs and founders of their recycling companies.

In addition , women have a strong presence in the circular habit of “reuse“ and arts and crafts where plastics are creatively converted into plastic materials into fashionable objects like plastic jewelry or beads, including plastic being a medium for creating art works and furniture.

5.4 Gaps Associated with Female Participation in the Plastic Recycling VC

Some of the gaps associated with female participation along the plastic recycling VC could include the following:

a. Little participation of women at the informal sector of plastic recycling due to the pecularities of the sector.

b. Few initiatives by both government and private sector to drive and sustain gender and youth inclusion in plastic waste recycling

c. The Covid-19 pandemic has stalled physical engagements by advocacy groups in engaging rural communities for encouraging more female participation in plastic recycling initiatives

d. Skills and capacity gaps for business and financial management especially for the uneducated women in both rural and urban commmunities.

e. Lack of financial support from financial institutions to lend funds to plactic recycling ventures at micro level.

5.5 Recommendations for SEDIN Interventions on Participation Gaps for Women

SEDIN can provide interventions and support to improve the number of female actors in the recycling VC by engaging in the following:

a. Organize workshops targeted at women for advocating the opportunities around plastic recycling as an income generating venture while stressing the environmental impact of poor disposal and consumtion habits.

b. Partnerships should be built with capacity building institutions and industry players to equip these women with the requisite skills to build sustainable plastic recycling micro ventures that can scale and employ more women in target communities.

c. Perception change is critical in the sense that women should be able to play along any segment in the VC if the right resources and enablers are provided for work effeciency like proper gears and working equipment.

d. Collaborations with impact investors and plastic packaging companies to invest in women in order to build plastic recycling businesses and create wealth by saving the environment from the plastics produced by these companies. This will help to create access to finance, market and opportunities for women led plastic recycling businesses.

In addition, these women are largely found within the active working space of recycling companies playing in various sectors across the VC. However unemployed women in rural communities and the cities also make up this population in need of interventions to scale. However, women are very responsive to programs with the right advocacy strategy.

5.6 Policies for Female Participation in the Plastic Recycling VC in Lagos State

There were no such policies found in the course of this research that hinder women to compete favorably with their male conterparts along the plastic waste recycling value chain of Lagos State. All initiatives, programs, policies and pilot shemes developed by Lagos State or in collaboration by other entities around plastic recycling are all tailored towards empowering women and the youth through unlocking the opportunities of the sector as an enabler for job creation and environmental responsibility.

6. Lagos State Policies on Plastic Waste Recycling

6.1 Current Position of Lagos State Government on Recycling with focus on Plastics

Lagos State is transiting from traditional waste management to conversion of waste materials – an innovation that is projected to generate 6,000 jobs. The recycling is also expected to promote a cleaner environment, which will promote good health and boost aesthetics.

The Commissioner for Environment spoke about the setting up new dumpsites in improve holding capacities , prompting the switch to waste conversion to reduce the volume of waste being taken to the dumpsites.

Already, the pilot scheme for recycling has been rolled out by the Ministry in organized housing estates, employing a mobile application known as PAKAM, which enables users to request for pickup of recyclable materials from their homes by registered aggregators on the mobile application.

The mobile app's usage had been growing organically with over 2,000 kilograms of waste transactions being conducted on the app, which registered 41 recyclers and over 120 aggregators.

Lagos State is currently focusing on plastic waste because of its non-degradable nature. Waste conversion is our top agenda now and one of the strategies being employed is to start from organized residential areas across the State, such as gated estates where we have residents' associations. The recycling process has commenced in a number of estates and distributed plastic separators to sort waste materials at sources in order to make the recycling process easier.

Lagos State government through the Ministry has identified that circular waste recycling would reduce the amount of waste generated and transported to landfills. The Ministry had manufactured a recycling bank in its premises to aid waste conversion, adding that efforts were being made to establish recycling banks in Government-owned estates across the State.

Furthermore, boosting human capacity in waste collection has generated over 30,000 jobs adding that LAWMA had increased the number of trips completed daily at landfill from 357 to 850 on the average; 87 new waste collection vendors were engaged to drive up efficiency in the value chain.

6.2 Policy Guidelines on Plastic Waste Management in Lagos State

Plastic waste materials make up a significant proportion of solid wastes and litter in Lagos State adding that it has become a highly visible part of the waste stream (PET, Styrofoam and nylon commonly being used for Water & beverages, take away plates & cups, Carrier bags and others).

In view of the increasing prevalence of plastic waste and its negative effect on the environment in recent years, the Lagos State Government is set to put in place policy guidelines for Plastic utility to ensure a sustainable management of plastic waste. The policy guidelines will also be backed up with appropriate legal framework to be established through an enabling law.

Some guidelines for plastic utility to ensure a sustainable management of plastic waste with appropriate legal framework established through a law with provisions for the continuous implementation of the policy in Lagos State include the following :

a. Disseminate plastic waste management knowledge to others including stakeholders in user-friendly formats.

b. Incorporate sustainable plastic waste management knowledge into government implemented public awareness initiatives.

c. Effective plastic waste management is fundamental to delivery of the State government's priority transformational agenda as laid down in Lagos State Development Plan (LSDP)

because it is a resource that can be managed to achieve economic, social, and environmental benefits.

d. Sustainable plastic waste management will create value from the waste stream and formalize the waste-pickers' sector to improve livelihoods and reduce the pressure on landfills.

e. Private sector participation in plastic waste management activities to include but not limited to waste collection, transportation, building and operation of treatment plants, waste recovery and recycling.

f. Measures to control plastic waste that gets into the environment by either banning its sale or imposing taxes on stores that sell plastic products.

6.3 Plastic Waste Initiatives Driven by Lagos State

Lagos State in its bid to manage plastic waste in the state has developed initiatives like the follwoing:

a. **Lagos Recycle Program**:
Program Objective- The program is geared towards tackling the challenge of plastic pollution, through recycling and waste management reward system for residents of the State.

Lagos Recycle Program is designed to deploy a smart and attractive reward system to encourage waste segregation and timely pick-up of recyclables, emphasizing that residents would be rewarded for gathering their plastic items and handing them over to LAWMA accredited recyclers. The smart initiative is also designed to run on a mobile App called PAKAM which is deployed for effective collection and management of recyclable wastes in real-time.

b. **Trash for Cash**:
Program Objective- Proper plastic waste disposal in order to reduce all forms of pollution in the state and also encourage the waste to wealth initiatives to rescue the environment from negative impacts of climate change.

Trash for Cash is an initiative driven by LASEPA in collaboration with the Cleaning Practitioners Association of Nigeria, CPAN to mark the year 2021 World Environment Day (WED) with the theme: "Ecosystem Restoration" and jointly called for collective action against indiscriminate disposal of plastics and all other recyclable wastes in the drainages, oceans, and other water channels so as to prevent drinking polluted water and eating poisoned sea foods.

c. **Pick a Plastic Campaign**:
Program Objective- The initiative is aimed at educating Lagos communities on waste separation from source and rewards for collection of post-consumer packaging waste,

especially plastics for recycling.
The program is a partnership initiated by the Green Janitors Sustainability Initiative and Lagos State Waste Management Authority (LAWMA) and also involves the Food and Beverage Recycling Alliance (FBRA).
FBRA has been embarking on community enlightenment campaigns through the rewards programme to reduce environmental pollution, create awareness for segregation at the source and encourage proper disposal of waste, especially plastics that have contributed to flooding in most areas. It is committed to doing more to enhance the recovery, collection and recycling of post-consumer packing waste from the environment.

6.4 Plastic Waste Recycling Initiatives by Industry Players

Some key players in the plastic waste recycling ecosystem of Lagos also create innovate initiatives that help build their productivity while adding value to their immediate communities through a rewarding and sustainable model:

a. **RecyclePoints**: Recycle points has an incentive based model where they collect plastic from their registered collection partners and the plastics collected are rewarded by accrued points which are redeemable as cash in the long run.

b. **Wecyclers**- Wecyclers also exchange plastic waste and other forms of waste for credits or cash and even household items. This has encouraged many house holds to take responsibility for their waste generation and collection to receive tangible income.

   Wecyclers recently developed a new project where parents can use credits earned from plastic waste to pay for their children's school fees. This model is being piloted with a primary school and will be rolled out too many more schools in the future.

6.5 Associations and Bodies Supporting Plastic Waste Management

Recyclers Association of Nigeria (RAN):

The mandate of Recyclers Association of Nigeria is to provide guiding principles of having a positive impact to achieve a sustainable circular economy in Nigeria.

The objective of the association is as follows:

- Material Recovery: By engaging in activities that reduce waste to landfill to the barest minimum for an improved circular economy.
- Advocacy: By being the leading voice for the waste and recycling industry at the Federal, state, and local government level, advocating on behalf of our members by advancing policies to help make our industry safer and to promote growth and innovation.
- Green Investment: To facilitate investment opportunities and activities considered good for the environment and profitable to members.
- Partnership: To encourage partnerships opportunities and a healthy relationship among members and stakeholders in the industry.
- Safety: We work to make waste collection, processing, and disposal operations safer through

training, promoting best practices, advancing safety legislation and by setting industry equipment standards.

Food and Beverage Recycling Alliance (FBRA):

The Food and Beverage Recycling Alliance was established in 2013 as the producer responsibility organization (PRO) for the food and beverage sector with a focus on enabling the collection, recovery, and recycling of the post-consumer packaging waste in compliance with the extended producer responsibility guidelines. The alliance currently has some of the largest food and beverage companies in Nigeria as its members such as Nestle Nigeria, Nigerian Breweries, Coca-Cola Nigeria, Guinness Nigeria, Omnik Limited, Engee PET amongst others.

FBRA also has collection partners such as Recycledge, RecyclePoints and several others. With the support of its member companies, FBRA has carried out various initiatives and projects in campaign awareness, promotion of proper disposal, and segregation. FMCG, plastic manufacturing, shoe manufacturing, shopping bag making companies amongst others benefit hugely from the recycled materials to manufacture their own product. Currently, the demand for recycled plastic is higher than the supply which gives room to unlock more opportunities within the plastic waste recycling space.

Nigeria is the third-largest importer of plastics in primary forms (virgin resins) in Africa with 70 per cent of resins currently being imported. Recently, the Standards Organization of Nigeria (SON) and stakeholders in the food and beverage industry developed a standard that would save Nigeria foreign exchange used in the importation of plastics. The new standards would improve production processes of plastics, ensure the use of rPET (recycled plastic) in production, ensure safety and the quality of products.

The new regulation has galvanized great interest and opportunity in the PET industry in Nigeria whose daily production is estimated to be with over 500 million PET bottles. A lot of players are ready to embrace this cost effective and environmentally friendly rPET circularity. PET is recycled into chips, granules, flakes, and pellets by companies such as Alkem Nigeria, Kaltani, Richbol, United Cyclers and then sold on to companies such as Engee PET who process into PET resins. The PET resins are then sold to companies playing in industries such as FMCG, food & beverage, pharmaceutical, etc.

Waste Pickers Union Lagos:

It is interesting to note that the waste pickers in Lagos have a functional cooperative they refer to as the Union which is made up of a Chairman and an executive committee and responsible for facilitating waste recoverry and recycling processes. The co-operative facilitates waste recovery and recycling processes. All the scavengers at the site belong to the Union and they pay weekly dues to the Union. Also, the different types of recovered materials have a sectional sub-system. For example, plastic scavengers have a lower-tier union while all the waste pickers on-site form one overall Union. This system of organization aims at protecting the interests of the scavengers from middlemen, while also protecting the interest of scavengers dealing in different materials.

7. National Position on Plastic Waste Recycling

7.1 Justification for Plastic Recycling in Nigeria (Over View)

- **Partnerships and Collaborations**:
  Nigeria has partnered with Ghana, Indonesia and Vietnam in a scheme supported by the World Economic Forum (WEF) aimed at curbing plastic pollution, which opens up a multibillion-dollar circular economy investment opportunities. The project is called the Global Plastic Action Partnership (GPAP), a platform encouraging governments, businesses, and civil society to translate plastic pollution commitments into concrete solutions, stakeholders will formulate a common approach to bring system change to the circular economy, creating new jobs.
- **The Program Objective**:
  The GPAP programme calls for a National Plastic Action Partnership (NPAP) model where the government creates a platform for bringing together stakeholders, from researchers to businesses to civil society, create a collective roadmap that lays out the concrete steps that would be taken in policy-making, manufacturing, awareness-building, and driving investment.

- Plastic Waste Generation:
  In 2018, Nigeria was estimated to have discharged around 200,000 tons of plastic waste into the ocean, which according to the WEF programme, should have been converted into wealth.

- **Nigeria's Plastic Market**:
  According to a study by Heinrich Boll Stiftung, a German government-funded environmental non-profit, there were over 3,000 plastic product companies with a production capacity of over 100,000 tons per year in Nigeria, in 2013. It has now doubled. Approximately 5 million tons of polypropylene were imported in primary form between 1996 and 2017 to supply companies that produce plastic diapers, margarine containers, yogurt boxes, syrup bottles, rakes, plastic bottle caps, biscuit wrappers, crates, drinking straws, among others.

- **Plastic Consumption** :
  In 2019 alone, Nigerians bought an estimated 45 billion litres of water in bottles and another 2 billion litres of carbonated soft drinks, according to research figures by Nigerian bottling companies. Annual plastics production is projected to grow by 523,000 tons by 2022, according to the WEF.

- **Investment Potential**:
  The International Finance Corporation (IFC) granted a loan of $39 million to Engee PET Manufacturing Company Nigeria for the construction of a continuous polymerisation PET resin plant in Ogun State. The facility will source more than 20% of its raw materials from local waste plastics, thus helping Nigeria in strengthening its recycling and manufacturing sectors in supporting jobs along the value chain.

- **Scaling Gender Participation**:
  In Nigeria, there are some local initiatives like 'Waste to Wealth' programme where women collecte plastics and are cleaned, cut into stripes, and convert them to accessories like bags, mats, and even laptop bags. However many of these are yet to scale.

7.2 Role of Regulators on Plastic Recycling- SON (Standards Organization of Nigeria)

SON is currently working on a draft policy around plastic recycling which the organization said the new standards would improve production processes of plastics and ensure safety and the quality of products. In addition, the new standards would also lead to an increase of its use which would provide opportunities for employment rather than expending the nation's hard-earned resources on importation. Nigeria spends **N1.8Trillion** on plastic importation annually. The food and beverage recycling association of Nigeria remains the driving force for the development of this standard.

The draft policy has been extensively discussed by all relevant stakeholders and it is currently being processed for approval by the relevant government agency. This is aimed at coming up with a workable standard that would guide manufacturers, promote trade, and assist regulation to guarantee acceptability without compromising the safety of the product and the environment.

8. Recommendations for Lagos State Plastic Waste Recycling VC

8.1 Recommended Solutions for Gaps and Risks in the Plastic Recyling VC

- Domestic Production of Plastic Recycling Machine in Nigeria:
  The capital-intensive nature of recycling discourages interested entrepreneurs, aside the cost of land for setting up a recycling center, it costs an average of N50 Million to acquire an imported plastic crushing machine . Most plastics recycling machine used in Nigeria are imported and costly, hence there is need to locally develope recycling machines for cheaper production. In view of this, only limited work has been done on the development of plastic recycling machines.

- Access to Capital or Finance:
  For Recyclers with capital issues, the government can fund the purchase of machinery and then monitor the operations, or fund a cooperative to support the business. Grants can also be made available through agencies to support land purchase and equipment. Development finance organizations like DNB , BOI should be better engaged by the Lagos State government to extend financial support in scaling the productive capacities of these recycling companies.

  This will encourage and attract entrepreneurs into the recycling business. In addition, seminars and workshops should be organized to educate people on the opportunities in

the recycling sector and encourage like-minded people to establish recycling outfits, by enlightening people to recognize that, recycling is not only a source of income but a support to the ecosystem as recycling of plastic would boost the economic status of Lagos.

- Research and Development:
  Partnerships and collaborations between the Lagos State government and private sector should be intensified in the areas of developing alternative materials to plastic, involving study on the adoption of indigenous and traditional packaging materials and the development of rPET and bioplastics. In addition, economic incentives are necessary to encourage the adoption of eco-friendly and alternative materials. Establishment of technological incubation. National Environmental Standards and Regulations Enforcement Agency (NESREA) and other involved agencies should be better empowered to ensure companies alignment to the terms of PROs. The success of the EPR requires the coordinated input from all sectors in the economy with strict sanctions introduced for non-compliance to the regulations

- Employment and income generator for Women and Youth:
  The unemployment rate in Nigeria today soars above 30% with underemployment at about 27%. With so much plastic in the environment to recycle through a value chain that consists of numerous untapped opportunities , there is a huge gap to fill especially in Lagos state where the plastic waste generation is huge, and unemployment at about 17%.

- Logistics:
  Logistics is a huge gap in the recycling value chain and this can be bridged with a heavy presence of private sector through impact investors and sustainable business models that can attract investments in the sector. Transportaion has been a lingering challenge for most recycling companies with most of the companies creating models of transfering transportaion cost to those in need of the plastic to pick up at their collection hubs. This model can be a viable method for reducing operational cost for small players who have to battle with small margins.

  Creation of new value chains from logistics could be developed like- a maintenance subsector where people are trained to be skilled technicians for the purpose of equipment repairs with prefernce to having a gender balance in training more women in that space.

- Disconnect between the informal and formal sector in plastic recycling:
  There is little or no help tailored towards the informal sector of the value chain with more investments streed towards the formal sector by the Lagos state government. There is a perception problem towards the informal sector players which must be changed by providing them the necessary support from working gears (PPE) to health insurance shemes due to their constant exposure to littred environments, especially at a time when the world battles with the covid-19 pandemic.

- Knowledge Gap/ Advocacay:
  The general public needs to be more informed about the use of plastic and proper disposal and consumption habits . This will inturn help collection efforts towards improving the productivity of the value chain from house holds and other potential plastic waste generating sources. Lagos State should intensify campaigns but online and offline channels in the most creative and illustrative manner to show both the negative impacts of irresponsible disposal habits of plastic to the environment and the opportunities it holds if properly collected and recycled for the benefit of all citizens.In addition schools and the younger ones should be engaged about the use of plastic and its effect to the planet in the long run.

- Incentivizing the value chain:
  The plastic recycling sector in Lagos State requires an incentive model that will attract communities , especially poor neighbourhoods to turn in their used plastics for rewards. A properly sedigned reward based collection system for plastic collection in Lagos state will go along way in attracting the required attention to see the value of plastic waste and the opportunities they present as a source of income while cleaning up the environment.

8.2 Recommended Interventions for SEDIN

SEDIN can support the plastic recycling sector in Lagos State through the following interventions:

- Partner with already existing players while building new players to create a sustainable ecosystem of plastic waste recyclers. Partnerships should be strategic and deliberate with Lagos State stakeholders like LAWMA, LASEPA, NESREA, Ministry of Environment etc . on the basis of building capacity, awareness, rural penetration, job creation, poverty reduction, women and youth empowerment.

- Indentify key capacity needs for VC players especially for women in the areas of:
  a. Soft skills (on leadership, problem solving skills, critical thinking among others)
  b. Business and financial management
  c. Improved work environment
  d. Subsidies on recycling equipment
  e. Create more awareness for the sector
  f. Incentives to encourage recycling and circular activities
  g. Begavioural change initiatives for plastics consumption and disposal.

- Engage Lagos State government through the right stakeholders for buy-ins to promote research and development (R&D) in developing technologies aimed at making plastic recycling more effective and productive for plastic recyclers in the state.

- Recommending financial intervention models through engagements with financial institutions or plastic producing companies to aid access to finance for players in the industry.

- Assist in policy drafts in collaboration with regulatory bodies and stakeholders in

strengthning models like the extended producer responsibility (EPR) aimed at ensuring plastic producing entities are more accountable and responsible for the amount of plastic they produce and their lifecycle.

9. Acknowledgements

The execution of this report was made possible through the support of industry players and stakeholders accross the plastic recycling value chain, which the NCIC owes its gratitude to, in the likes of Lagos State Waste Management Authority (LAWMA), Lagos State Environmental Protection Agency (LASEPA),Recyclers Association of Nigeria (RAN),Kaltani, Greenhill Recycling, JustStandOut, Pliris Waste Mangement and all other stakeholders who were contacted for their support and contribution.

The support and direction provided by the management and team of NCIC throughout the research period is recognized and appreciated.

10. Research Methodology

10.1 Methodology Adopted for the Research Findings

In conducting this research, the following methods were adopted to the derived results and information:

1. FGD (Focus Group Discussions): These are group sessions conducted and strategically aligned with achieving the goals and objectives of this research with industry players and stakeholders whose contributions shaped the execution of this research.

2. IDI (Indepth Interviews): These were one on one interviews with industry players and stakeholders whose personal opinions about topical issues in the research work were put into account.

3. Field Interviews and Engagements: Players along the value chain in both informal and formal sectors were engaged on the field for their contributions around challenges and gaps experienced in their daily operations.

4. Dumpsite Visitations: Dumpsites were visited in Oshodi, Alimosho area, Ketu, Owode, Ladipo to engage waste pickers and aggregate their current gaps in putting them into context for approriate recommendations.

5. Secondary Data: About 14 publications were cited as indicated in the reference section for data examination and staistcial contexts in analysing facts and figures aimed at creating projections and possibilities around the research findings.

10.2 Notes on Key Research Findings

During the course of the research, the following facts were discovered:

- Nigeria spends N1.8 Trillion on plastic importation.
- An average of 13,000 -15,000 tonnes of waste is generated in Lagos State daily.
- About 30% of the waste is recyclable
- About 50% of the recyclable waste generated in plastic
- Over 2,000 tonnes of plastic waste in generated daily in Lagos State.
- Less than 10% is recycled
- Plastic waste recycling in Lagos State is a potential $200 Million market
- Plastic waste recycling in Lagos can create over 10,000 jobs for women and the youth
- Scaling recycling companies with the right interventions will create jobs in Lagos State
- Women are capable to be industry leaders in the plastic recycling sector of Lagos State
- Ther are 6 types of plastics collected in Lagos
- Lagos State is currently working on plastic waste policies to be enforced
- Lagos Stateworks closely with with private sector to drive plastic recyling initiatives
- The informal sector plays a huge role in collection but given little attention and support
- Logistics and transportation is a huge challenge/gap in the plastic waste recycling VC
- Plastic recycling is capital intensive and requires financial intervention
- Financial support for developing Nigerian made recycling equipment is important
- Lagos State has a reward based pilot scheme for plastic recorvery
- Lagos State uses an App based solution called PAKAM as a pilot for waste management
- Public awareness on plastic pollution is low but can be better with the right initiatives
- Plastic collection is a major challenge and needs to be insentivised to encourage inclusion.
- SON is currently working on a policy to regulate standards for recycled plactic products

11. Picture Gallery

Alimosho LGA

Ketu

Oshodi (Group Picture with Waste Pickers)

Source: NCIC research pictures for GIZ (SEDIN) project on plastic waste recycling value chain.

12. References

1. About Lagos State 2021 https://lagosstate.gov.ng/about-lagos/
2. UIC Location and importance of Lagos State 2015 https://www.coolgeography.co.uk/gcsen/Location_Importance_Lagos.php
3. Lagos State Government 2021 https://lagosstate.gov.ng/blog/2018/02/03/lagos-waste-management-and-the-environment/
4. Scoping mission waste and circular economy of Lagos State 2020 https://www.rvo.nl/sites/default/files/2020/10/scoping-mission-waste-and-circular-economy-to-lagos-nigeria.pdf
5. Special Chem Report 2021 https://omnexus.specialchem.com/selection-guide/polyethylene-terephthalate-pet-plastic
6. ACME Plastics Report 2021 https://www.acmeplastics.com/what-is-hdpe
7. Azo cleantech publication https://www.azocleantech.com/article.aspx?ArticleID=240
8. Researchgate Publication 2021 https://www.researchgate.net/publication/216888726_Informal_waste_recycling_in_Lagos_Nigeria
9. Lagos State Ministry of Environment & Water Resources 2021 https://moelagos.gov.ng/2020/05/08/lagos-to-implement-policy-guidelines-on-plastic-waste-management/
10. Wastelessfuture 2016 https://wastelessfuture.com/a-value-chain-analysis-tool-for-informal-recyclers/
11. Implementing an Ethical Circular Economy in Lagos Nigeria. https://nnfng.org/wp-content/uploads/2020/09/Implementing-an-Ethical-Circular-Economy-in-Lagos-Nigeria.pdf
12. The Conversation Publication UK 2021 https://theconversation.com/endsars-how-nigeria-can-tap-into-its-youthful-population-148319
13. AllAfrica Publications 2021

    https://allafrica.com/stories/202001080106.html
14. Busines Day Publication 2021

    https://businessday.ng/news/article/billion-dollar-opportunities-for-nigeria-in-anti-plastic-waste-fight/

Pro-poor Growth and Promotion of Employment in Nigeria -SEDIN

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Abuja / NIGERIA
T +234 7044369589
E sedin@giz.de
I www.sedin-nigeria.net