



D2.1 Green Waste Job Market: Industry needs and available skills

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Abstract	This deliverable intends to identify the available skills and the needs that are currently short in the Green Waste Management supply chain in Ghana and Nigeria.
Keywords	Green Waste Management supply chain, industry roles, infrastructure, stakeholders' needs, stakeholders' skills, desk research, interviews, focus group, data analysis

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EXECUTIVE SUMMARY

D2.1 Green Waste Management Job Market: Industry Needs and Available Skills presents the skill gap analysis conducted in the context of Work Package 2 Think the Green Waste Management Skills and Jobs of the Future. The skill gap analysis combines desk research, data gathering from different sources (i.e. statistical data and supply chain projection growth), and qualitative interviews with industry decision-makers from the public and private sectors. The foremost objective of the skill gap analysis was to identify the skills that are currently short in the Green Waste Management supply chain in Ghana and Nigeria and that are: (i) in increasing demand because of the development of specific economic sectors, (ii) necessary to realise the regional development plan and/or (iii) helpful in improving the productivity of informal workers and alleviating poverty, (iv) essential to foster green and digital development in both countries. To achieve this objective an in-depth mapping of the waste management business segments was carried out to understand the operational processes, challenges, and expectations of stakeholders in the waste industry

Based on this analysis GreenVETAfrica is able to provide recommendations for the development of vocational training curriculum focused on deficiencies and demands, and on improving (i) employability (ii) competitiveness of the industry micro, small and medium businesses.

The results of this research are the basis for the analysis of skills shortages D2.3 *Gap Analysis*, and the design and pilot of an innovative vocational education and training programme (VET) for capacity building and for filling the current skills gap in the waste industry professions, led by Work Package 3 *Design the Green Waste Management VET Programme*. This will further support the potential integration of unemployed youth and vulnerable groups into the labour markets in Ghana and Nigeria, through the technical training opportunities provided by the GreenVETAfrica project.

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ABBREVIATIONS

AMA	The Accra Metropolitan Assembly
AWAMN	Association of Waste Managers of Nigeria
EPRON	E-Waste Producer Responsibility Organization of Nigeria
FBRA	Food Beverage Recycling Alliance
FGD	Focus Group Discussion
GVA	GreenVETAfrica
KMA	Kumasi Metropolitan Assembly
LASEPA	Lagos State Environmental Protection Agency
LSWMO	Lagos State Wastewater Management Office
MRF	Material Recovery Facility
NES	Nigerian Environmental Society
NGOs	Non-Governmental Organizations
PRO	Producer Responsibility Organization
PSP	Private Sector Participant
TLS	Transfer Loading Station
VET	Vocational Education and Training
WAMASON	Waste Manager Society of Nigeria
WAPA	Ministry of Women Affairs and Poverty Alleviation
WCTs	Waste Collectors Technologies
WMS	Waste Management Sector

1. INTRODUCTION

The green Waste Management Sector (WMS) is a growing industry focused on managing waste materials in an environmentally sustainable way. The sector is driven by the principles of the circular economy, which emphasise reducing waste, reusing resources, and recycling materials. Green waste management industry involves several key sectors for collection, transportation, recycling, composting and other waste conversions all deploying diverse skills and technologies to operations. The green WMS plays a critical role in reducing the environmental impact of waste and promoting a more sustainable approach to waste management. By diverting organic waste from landfills and producing valuable resources, the sector contributes to the transition towards a more circular economy and helps to mitigate climate change. The green WMS also focuses on developing innovative technologies and processes that can improve the efficiency of waste treatment and increase the value of the end products. A Harvard Business School study found that investing in the green WMS can create local jobs and stimulate economic development, particularly in rural and low-income communities. The study also notes the importance of public-private partnerships and innovative financing mechanisms to support the growth in the sector (Clark, 2015). Governments around the world are increasingly recognizing the importance of green waste management and are implementing policies and programs to promote sustainable waste management practices. For example, in the European Union, the Circular Economy Package aims to increase recycling rates and reduce waste generation (European Commission 2018), while in the United States, the Environmental Protection Agency provides funding and technical assistance to support sustainable waste management practices (UN 2019). To improve the operational efficiency of the green WMS, there is an increasing need for waste management vocational training centres to play a critical role in equipping individuals with the necessary skills to manage waste effectively and address the growing problem of waste management which is increasing with increasing population and urbanisation. These centres provide individuals with the knowledge and skills to manage waste effectively, reducing the impact of waste on the environment and public health; increased demand for waste management services also places increased need for individuals with the necessary skill set to manage waste effectively. The vocational training will improve employability which can help individuals to secure employment in the waste management industry. Waste management vocational training centers play a critical role in addressing the growing problem of waste management, creating job opportunities, and promoting sustainable development (UNEP, 2015). The European Union funded an Erasmus+ project on Green Waste Management and Micro Entrepreneurship Vocational Education Training (GreenVETAfrica) in Lagos State, Nigeria and Ghana (Accra and Kumasi). The GVA project aims to determine the available skills and the industrial needs in the Waste Management sector in Nigeria and Ghana. West Africa has both supply and demand issues to which the present form of post-school is unable to respond adequately. The Vocational Education Training (VET) sector in the project areas is characterised by a significant lack of practical relevance and responsiveness to labour market needs, insufficient infrastructure and equipment and extremely low throughputs. A major challenge is posed by the quality of teaching. With lecturer training mainly taking place at universities, only a few lecturers combine pedagogical competencies with technical qualifications and industry experience. The graduates of VET programmes are often seen as irrelevant or distant from what the 'employers' want. Students and their parents then perceive the quality of these institutions as being weak, not fulfilling their promises and therefore vote with their feet and walk away as they see them as poverty trap (Van der Berg, 2011). The project has set an overall vision for a "modern" VET system that is on one hand led by the school system but works closely with the productive sector and responds directly to the changing competence needs and qualification requirements in the labour market. The combination of a "top-down" and "bottom-up" approach in conjunction with the growing economic needs will produce remarkable results in the green WMS. GreenVETAfrica ambition is to contribute to the Talents' Partnership on Migration analysing West Africa's (with a focus on Nigeria and Ghana) green job market needs and skill gaps, with curricula fit to purpose and offer unemployed youth (especially women) the necessary skills and competences to find relevant jobs (or to start their innovative micro-enterprise) in their own countries.

2. THINK THE GREEN WASTE MANAGEMENT SKILLS AND JOBS OF THE FUTURE

Work package 2 of the GreenVETAfrica project is the Think the Green Waste Management Skills and Jobs of the Future. The Work package is designed to conduct a skill gap analysis and provide recommendations that will help to design curricula for vocational and business training programs focused on deficiencies and demands, and on improving the competitiveness of the waste industry: micro, small and medium businesses. The foremost objective of this analysis is to identify the gaps between the skills that are currently available and the skills that are required in the Green Waste Management supply chain in Ghana and Nigeria, given the following premises:

- Growth in the demand of skilled workers due to the development of new specific economic sectors;
- Urgency to implement the regional development plan;
- Opportunity to improve the productivity of informal workers and alleviating poverty.

This analysis helps to further develop training and education programs, ensure that individuals have the necessary skills to perform their job roles effectively, and ultimately improve the quality of waste management practices. Some of the specific objectives are:

- Identifying the key skills required for different job roles within the waste management industry;
- Assessing the current level of skills of the workforce in the waste management industry;
- Identifying the gaps between the current skills of the workforce and the required skills;
- Developing strategies to address the identified skill gaps, such as training and education programs.

GreenVETAfrica focuses on market-driven skills demand analysis which stems from actual or anticipated business activities. The skill gap analysis for the GVA project was carried out by the Academy of the Lagos Waste Management Authority (LAWMA) which is the agency of the Lagos State Government statutorily charged with solid waste management. The skill gap analysis will be conducted using different research approaches like desk research, data gathering from different sources (i.e. statistical data and supply chain projection growth) and qualitative interviews with industry decision-makers both from the public and private sector. Summary of the task Think Green Waste Management Skills and Jobs of the Future are detailed in Table 1 below:

TABLE 1 SUMMARY OF WORK PACKAGE 2 ACTIVITIES

S/N	ACTIVITIES	STEPS/ PROCEDURE
1	Carry out an in-depth research in the waste management business segments, listening to the “pain and expectation” of the entrepreneurs/ leadership on the “shop floor”	<ul style="list-style-type: none"> • Identify stakeholders in the waste management green segment (government, policy makers, private sectors, informal sector) • Structure and Administer Questionnaires • Conduct Interviews • Carry out a focus group discussion with stakeholders
2	To assess the future of Green jobs in Nigeria and Ghana and possible implications for the West Africa region	<ul style="list-style-type: none"> • Analyse data from (1) above • Make projections based on current approach/challenges and future prospects
3	Assess available skills and available relevant VETs offering in West Africa	<ul style="list-style-type: none"> • Map out available skills in the waste management business segment and their roles

		<ul style="list-style-type: none"> • Desktop research and consultations on VETs offerings that are relevant to the work package in West Africa
4	Provide a skill gap analysis and recommendations to develop curriculum designs for training courses and business training programs totally focused on deficiencies, demands and on improving the competitiveness of industry, micro, small and medium businesses	<ul style="list-style-type: none"> • Analysis of the data from 1,2,3 above • Engage all partners in the skill gap analysis based on the research outcome

Focus was on the features of the local/regional economy, growth trends in the green waste management supply chain, various factors affecting economic growth, untapped local opportunities and investment climate, among others. The scope and depth of the analysis are confined to the aforementioned areas with the purpose of skills demand analysis in mind. GVA team will qualitatively interpret development priorities in terms of skills demand based on the assumption that only with the appropriate skilled human resources, organizations can achieve their development goals. The results of the analysis will inform the development of targeted training programs and policies to improve the skills of the workforce in the WMS (Mavropoulos, 2017).

2.1 GENERAL OVERVIEW OF THE WASTE MANAGEMENT INDUSTRY

The waste management industry comprises a broad range of activities related to containerization, collection, transportation, processing, disposal, and waste recycling. This includes solid waste, hazardous waste, medical waste, electronic waste, and others. The industry is driven by the growing concern for environmental sustainability, public health, and safety. Waste management companies manage and control the waste generated by households, businesses, industries, and other entities. The waste management process typically involves the following steps:

1. **Containerisation:** This involves the provision and use of proper waste receptacles or bins appropriate for the volume being generated from respective/designated tenements, institutions, and industrial or commercial premises;
2. **Collection:** Waste is collected from various sources and transported to a designated facility for processing or disposal;
3. **Transportation:** Waste is transported by various means such as trucks, trains, and ships to processing and disposal facilities;
4. **Processing:** Waste is sorted, separated, and processed to extract valuable materials for recycling, reduce the volume of waste, and convert waste into a usable form;
5. **Disposal:** Waste that cannot be recycled or reused is disposed of in designated landfills or incinerators.

The waste management industry is an important sector that plays a critical role in promoting environmental sustainability and protecting public health. According to a report by the World Bank, global waste generation is expected to increase to 3.4 billion tons by 2050, with low and middle-income countries projected to account for most of the growth (World Bank, 2018). As such, the waste management industry is expected to continue to grow in the coming years, presenting both challenges and opportunities for governments, businesses, and other stakeholders.

The industry is confronted with several challenges, including increasing waste generation, limited landfills, and the need for sustainable waste management practices wherein improper treatment and disposal may cause serious socio-economic downturns. Despite these challenges, the waste management industry also presents significant opportunities for innovation and economic growth. This includes the development of new technologies for waste treatment and disposal, as well as the creation of new businesses and jobs in the WMS. In addition, there is growing recognition of the

role that the waste management industry can play in promoting circular economy principles, which prioritize the sustainable and efficient use of resources. As a sector, it has shown its ability to innovate, as well as work collaboratively towards a sustainable and circular economy. The industry has moved away from being seen as an industry that is dirty and unskilled, now there are a variety of job opportunities that are available across the waste industry. It is an industry that is developing and evolving with vigour and huge potential for career progression.

The skill requirements of the waste sector are evolving and it is now seeking more technically-skilled, operational and business-oriented people since it deals with multidimensional problems that require technology, economics, sociocultural and political activities to go hand in hand. With this in mind, there is real potential for the waste industry to become a highly skilled workforce and a career-based industry.

3. WASTE MANAGEMENT IN NIGERIA AND GHANA

Waste management is a critical issue that affects the environment and public health in many African countries, including Nigeria and Ghana. Proper waste management practices are crucial in reducing the negative impacts of waste on the environment and on human health.

Waste management poses significant challenges in Nigeria due to the country's population growth, urbanization, and economic development. The improper disposal of waste has led to environmental pollution and public health problems. In a study published in the *International Journal of Environmental Research and Public Health*, Ezeah et al. (2018) assessed the current status of waste management in Nigeria and identified the challenges faced by the sector. The study found that the lack of appropriate infrastructure, institutional capacity, and funding were major challenges to sustainable waste management in Nigeria. The authors suggested that a coordinated approach involving all stakeholders, including the government, private sector, and citizens, was necessary to address the challenges of waste management in Nigeria.

According to a report published by the World Bank (2018), Nigeria generates an estimated 44.7 million tonnes of waste annually, of which 2.5 million tonnes are plastic waste. The report notes that the waste generation in Nigeria is projected to increase by 28% to reach 72 million tonnes by 2050, as a result of population growth and urbanization.

The country generates over 12 million tonnes of waste annually, with only a fraction of it properly managed. Poor waste management practices, such as indiscriminate dumping, open burning, and lack of segregation, have led to environmental pollution, public health risks, and economic losses.

A study published in the *Journal of Environmental Management* by Amoako-Tuffour et al. (2021) examined the challenges of waste management in Ghana and proposed a sustainable waste management framework. The study identified inadequate funding, weak institutional frameworks, and limited public participation as major challenges to sustainable waste management in Ghana. The authors suggested that a collaborative approach involving all stakeholders, including the government, private sector, and citizens, was necessary for addressing the challenges of waste management in Ghana.

In conclusion, waste management is a critical issue that requires a collaborative effort from all stakeholders to address the challenges facing Nigeria and Ghana. These challenges include inadequate funding, weak institutional frameworks, and limited public participation. Proper waste management practices are essential for reducing the negative impacts of waste on the environment and human health in both countries.

Like Nigeria and Ghana, waste management is a crucial issue in many cities around the world. Accra, Kumasi, and Lagos are three major cities in West Africa facing waste management challenges. This study aims to appraise the waste management practices in these three cities, with a focus on the skill gaps and the development of vocational education and training to support skill deficiencies in these cities.

Accra, the capital city of Ghana, generates an estimated 3,000 metric tons of waste per day, with only 60% of it collected and disposed of properly (Ghana Statistical Service, 2019). The city has several waste management companies, including Zoomlion Ghana Limited and Waste Landfills Company, responsible for waste collection and disposal. However, the lack of proper waste sorting and recycling facilities remains a major challenge for the city. The government is working on a plan to establish a new landfill site and implement a comprehensive waste management system (Mensah, 2020).

Kumasi, the second-largest city in Ghana, generates approximately 1,500 metric tons of waste per day (Ghana Statistical Service, 2019). The city has an active waste management program, with several private waste management companies, including Zoomlion Ghana Limited, tasked with waste collection and disposal. Additionally, the city has a waste sorting and recycling facility that produces compost from organic waste (Owusu-Ansah et al., 2020). However, illegal dumping of waste remains a significant problem in the city.

Lagos, the largest city in Nigeria, generates an estimated 13,000 metric tons of waste per day (Lagos State Ministry of Environment, 2020). The city has a semi-privatized waste management system, with several private waste management

companies responsible for waste collection and disposal. However, the system is fragmented, leading to inadequate coverage, and illegal dumping of waste is widespread (Akanni & Adelekan, 2020). The government is working on reforming the waste management system, with the introduction of a new waste management law and plans to establish new waste sorting and recycling facilities.

In conclusion, waste management remains a significant challenge in Accra, Kumasi, and Lagos. Although all three cities have waste management programs, there is an important need for improvement, across the different operations and the value chain, i.e. in waste sorting, recycling facilities and the reduction of illegal dumping. The challenges faced by these cities highlight the need for a comprehensive waste management strategy that involves waste reduction, proper waste collection, sorting, and recycling.

3.1 WASTE MANAGEMENT IN LAGOS STATE

Lagos, the commercial center of Nigeria is the smallest in size with a land area of 3,755 square km. The State has an approximated population of over 20 million people with a population density of over 4,000 persons per square kilometer. Home to the largest urban metropolis in the country, Lagos State is the economic powerhouse of Nigeria, and, more importantly, a rapidly-growing economy in business opportunities and aspirations. This growth has also been accompanied by a rise in multiple challenges and has continued to navigate the hurdles of inadequate infrastructure, poor safety and security, weak social services and a polluted and vulnerable environment.

Law and Regulations

The Lagos State Ministry of the Environment is the overall policy formulator of environmental issues in Lagos State, including solid waste management which is a very important component of the environment sector. LAWMA is the Government Agency that is statutorily charged with the implementation, advocacy, monitoring and enforcement as it relates to municipal solid waste management. Thus, it handles and sets the regulations for the collection, transportation, treatment, disposal and general handling of solid waste generated from different sources within the Lagos precincts such as: Households, Markets, Industrial Locations, Offices, Schools, Highways, Hazardous, Medical and Laboratory Wastes as well as Construction Sites. However, in view of limited budgetary allocation to such services that have low initial monetary returns on investments vis-a-vis the challenge of delivering efficient and cost-effective waste service, the State Government, like other cities of the modern world, resorted to privatization. Hence, LAWMA performs supervisory and regulatory roles to enlisted Private Sector Service Providers popularly called the PSP.

Lagos State generates about 13,000 metric tons of waste at a Generation Per Capita (GPC) rate of 0.65kg/person/day. In the last decade, particularly between 1997 and 2007, the cumulative tons of waste deposited in the three dumpsites located in Abule-Egba, Olusosun and Solous was estimated to be about 27, 599,825.94 metric tons. According to a 2007 Waste Analysis by the Lagos Waste Management Authority (LAWMA), the components of the waste stream of the State include vegetables, plastics, papers, metals etc. Thus, Fig. 1 presents the waste categorization which shows Plastics 15%, Vegetables 45%, Papers 10%, Fines 8%, Putrescibles 8%, Glass 5%, Metal 5% and Textiles:

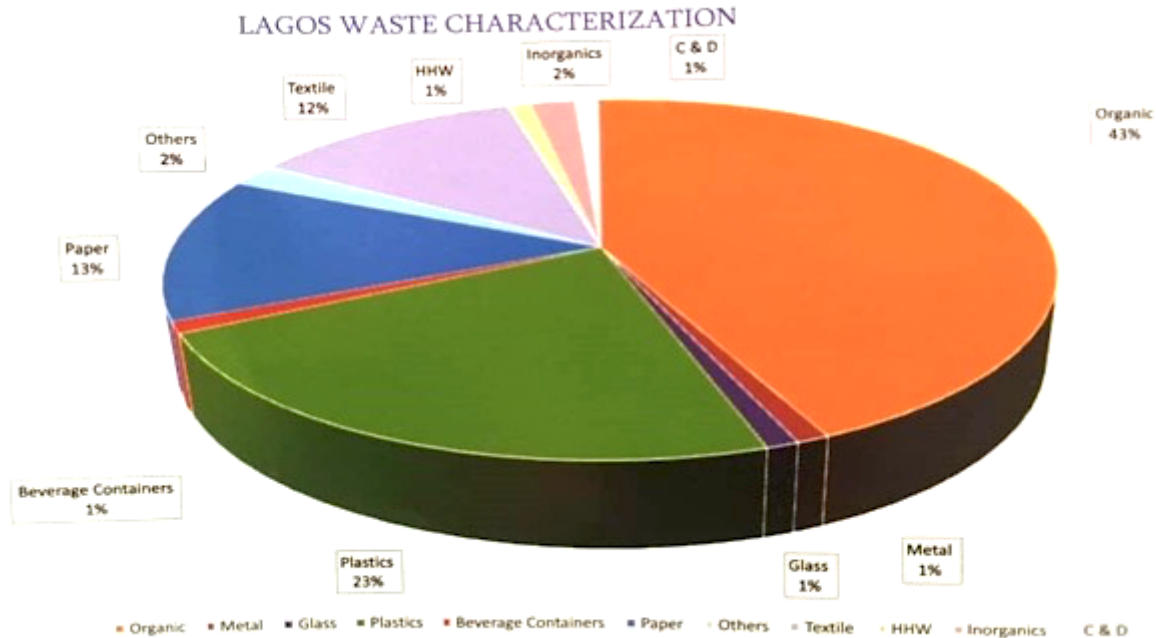


FIGURE 1 WASTE CHARACTERISATION FOR LAGOS 2015

Solid Waste Collection Framework

Basically, LAWMA collects all waste from places categorized as public areas namely: highway, major roads and streets while the PSPs are assigned to other non-public areas such as households, schools, hospitals, construction sites, industries, shopping complexes, office blocks, hotels and so on. Thus, the collection of solid waste is done jointly by both the State Government through LAWMA and the PSP. While LAWMA collects solid waste from public places every day, on a two or three –shifts basis, the PSP collects once or twice weekly and adopts the door-to-door collection for household waste while commercial waste collection rate depends on the type and volume of waste generated by the facility. As at 2006, PSP was managed by the Ministry of the Environment, while LAWMA took this responsibility over in 2007 for proper and more cost-effective service delivery, being a means to achieving its statutory end of effective and efficient solid waste management. Currently, there are 417 PSP operators partnering with the state government in the area of solid waste collection and transportation.

For effective coverage, the State has been divided into six (6) operational districts: East I, East II, West I, West II, Central I and Central 2 serviced by Nine Hundred and Sixty-One (961) service providers for prompt sweeping and bagging of litters and silts.



FIGURE 2 SHOWS HOW LAWMA COLLECTS SOLID WASTE

Containerization of Waste

For the purpose of achieving and maintaining a clean and healthy environment at all times, waste containerization is encouraged in Lagos State as evident in waste containers of various sizes and specialisations dotting strategic locations of the Lagos Metropolis. Most evident places include highways, market places, event centres while households are also expected to maintain at least one refuse bin at any particular time.



FIGURE 3 IMAGES SHOW BINS THAT ARE USED FOR WASTE CONTAINERISATION

4. Containerization of healthcare waste

Healthcare wastes are special categories of waste and their containerization also requires special care. The State Government, through LAWMA, gave training and funded the distribution of colour coded bags and injection safety boxes to health care facilities to encourage at-source segregation of pathological waste from non-pathological ones. The use of colour coded air tight waste bins for the storage of bagged healthcare waste is also encouraged to ensure the proper handling and containerization of this highly sensitive and infectious waste. Also, LAWMA is in partnership with the private sector to construct smokeless incinerators across the state for safe treatment and disposal of medical/healthcare waste. Currently, there are three (3) functional privately-owned medical waste incinerators and one (1) blood destruction incinerator located within LAWMA facilities at Ikorodu, Agege and Simpson TLSs. About three other incinerating plants are under construction at strategic locations within the state.

4.1 Waste Disposal

There are five (5) official disposal sites for solid waste in Lagos: Olusosun, Solous, Ewu-Elepe, Epe and Badagry, with a combined capacity of about 164.5 hectares. Olusosun is the largest of the sites, covering about 42 Hectares. However, there are a few illegal smaller sites that abound in the state.



FIGURE 4 IMAGES OF OLUSOSUN DUMPSITE

4.1.1 WASTE MANAGEMENT FACILITIES IN LAGOS STATE

Transfer loading station (TLS)

TLS is a point where waste is first deposited or “warehoused” prior to transportation to dump site or landfills at off-peak (traffic) periods. The transfer stations were established to: improve turn-around time, reduce the carbon footprint, decongest traffic at the dumpsite and reduce the transit volume of waste by about 60%. The State Government proposed to build twenty (20) Refuse Transfer Loading Stations (TLS) at strategic locations in the State but presently, there are 3 functional TLSs in Lagos State with additional three under construction.



FIGURE 5 IMAGES OF A TRANSFER LOADING STATION IN LAGOS

Material Recovery Facility (MRF)

Material Recovery Facility is for the recovery of valuable materials for reuse, recycling, manufacturing, material conversion as well as renewable energy for power and embedded energy which is just evolving. Specifically, resource recovery programmes in which the State has focused attention are: plastic (HDPE) and nylon (LDPE) wastes, composting – vegetables and other organic waste, briquetting – sawdust, tyres, metals, e-waste etc.



FIGURE 6 PICTURES OF A MATERIAL RECOVERY FACILITY

Waste Composting Facility

LAWMA, in partnership with Earth care Nigeria Limited, has a composting plant for the conversion of organic/biodegradable components of the waste stream. These are then used as fertilisers and additives that provide nutrients to the soil for horticultural/agricultural purposes.



FIGURE 7 PICTURE OF A COMPOSTING FACILITY

Briquette Plant

The briquette plant was installed with the support of the ecological fund by the Federal Government of Nigeria for production of biomass briquette using 100% organic materials from sawmill and plant markets.

Medical Waste Incineration Plant

LAWMA in partnership with some private investors developed smokeless incineration plants for the treatment of waste from medical facilities in the State. The smoke generated during the Incineration process is treated and converted to syngas which is used to run the gas generator for electricity generation within the facility. This enhances the safe disposal of medical waste and prevents infections and hazards from handling and comingling of medical waste with general waste.

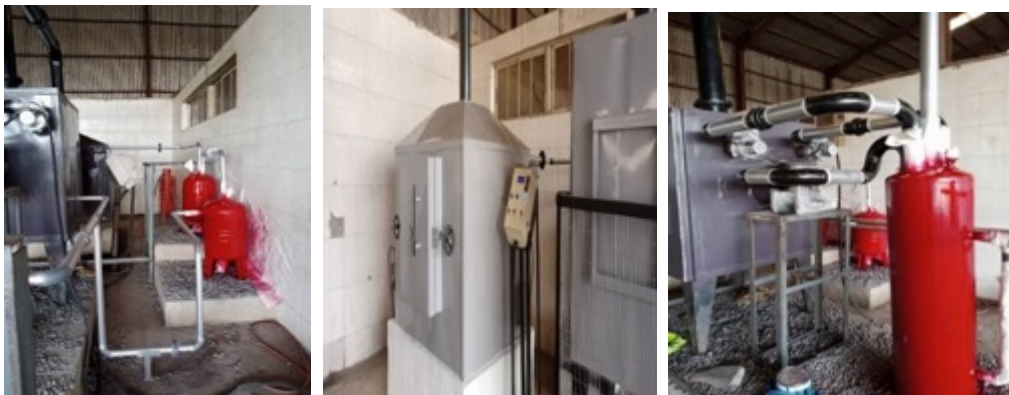


FIGURE 8 PICTURE OF A MEDICAL WASTE INCINERATION PLANT

4.1.2 KEY STAKEHOLDERS IN WASTE MANAGEMENT IN LAGOS STATE

Waste management industries in Lagos state are responsible for handling, collection, processing and the treatment of solid wastes in the state. Chains of varied professionals and investors with a passion for the environment invested in the solid waste sector of the state while the government is making efforts to create an enabling environment that guarantees returns on investments and environmental sustainability.

The processing and treatment of solid waste is highly dependent on technology and Lagos, a third-world megacity, implements some level of processing and treatment. As technology encompasses methods, procedures as well as equipment, processing and treatment occupy an important position in the scheme of efficient solid waste management and are indeed an important intervention. This is more so as it determines the quantity (volume) and quality (complexity) of the waste that is eventually disposed of, while it is influenced by technology (type, level and sophistication). Some of the treatments and the key players are summarized below.

Domestic/Commercial Waste Collectors (PSP)

PSP are assigned to non-public areas such as households, schools, hospitals, construction sites, industries, shopping complexes, markets, office blocks, hotels and other commercial facilities. PSP operators collect waste at least once weekly from households while waste collection from industrial and commercial facilities, such as markets, schools etc., depends on the type and volume of waste generated from such facilities.

Public Waste Collectors

A waste collector, also known as a garbage collector is a person employed by a public or private enterprise to collect and dispose of municipal solid waste (refuse) and recyclables from residential, commercial, industrial or other collection sites for further processing and waste disposal. Areas categorised as public areas are the highways, major roads, streets, illegal dump spots and public bins locations. LAWMA is responsible for waste collection in public places and evacuation of public bins.



FIGURE 9 PICTURE OF LAWMA OPERATION TEAM ON THE FIELD

Medical Waste Collectors

Are registered to collect healthcare and medical wastes generated in the course of treatment and care in hospitals, laboratories, clinics, veterinary clinics etc.

E-Waste**Collectors**

Are involved in the collection and dismantling of E-waste such as batteries, keyboards, phones, laptops and computers, monitors, fridge, air conditioning from the source (individuals/households/markets) for sales to e-waste recyclers. Collection of e-waste is dominated by the informal sector

Pre-processors

Pre-processing is the second level of recycling of e-waste. Sorted e-waste from collectors is further sorted into components and treated before it is exported for recycling. E-waste is sorted into various components such as motherboards, the circuits etc. There are three e-waste pre-processors in Lagos State and they are: Hinckley, E-Terra and DM Recycler.

4.2 THE RECYCLING VALUE CHAIN



FIGURE 10 THE RECYCLING PROCESS

Recycling is the conversion of waste materials into new, useful products. It gives materials an opportunity to remain longer in the value chain as useful products and reduces the over-dependence on raw materials. It is also one of the most effective ways to manage waste, preventing pollution, ensuring a clean and healthy environment and creating wealth in return. Recycling involves a long chain of business commands with key players such as the collectors, aggregators, pre-processors and processors in the recycling value chain.



FIGURE 11 IMAGE OF A RECYCLING BANK

Informal Sector

Collection of recyclable materials is predominantly carried out by the informal sector. The contribution of the informal sector to the recycling landscape is enormous, however, their activities negatively impact or disrupt the waste management system in operation. Currently, study and models are being examined to fully incorporate the sector in the current waste management system. Informal waste collectors are involved in the collection, sorting, sale and purchase of recyclable materials without any formal arrangement and/or registration with the authorised body or government. Informal collectors use bags or carts in picking waste or recyclable materials from bins, drainages and landfills. Waste pickers contribute to local economies, to public health and safety, and to environmental sustainability. They help in terms of decreasing the amount of virgin materials needed for production and conserving natural resources and energy, while reducing air and water pollution on the other hand.

The informal waste collectors impact the solid WMS by gathering garbage from public spaces, diverting significant quantities of materials from the waste stream, providing reusable materials to other enterprises and helping to reduce the amount of waste by picking the recyclables from households, markets etc. In Lagos State, the informal waste economy comprises over 18,000 cart pushers which include cart builders, waste pickers, resource merchants and recyclers. Thousands of waste workers reclaim enormous value from waste all over the state and over five thousand waste pickers operate on dumpsites across the state. The waste workers are semi-organized as it is evident in the hierarchical structures that they have created, which is based on economic, material supply and power relations. The recovery of post-consumer waste in cities in the developing world is majorly driven by the informal ecosystem.



FIGURE 12 PICTURE OF INFORMAL WASTE COLLECTORS

The Recycling Formal Sector

These are businesses or groups of individuals who are registered with the authorised body/government involved in the collection of segregated waste from source.

Application Software for Recyclable Collection/Pakam App

The PAKAM software application is an Uber-like application that enables residents to request for pickup of recyclables in their homes by registered aggregators on the application. It is a unique waste recycling management App that focuses on enhancing the waste collection ecosystem in Lagos State, with a unique value proposition that hinges on creating a cleaner and healthier environment. The App offers a rich waste recycling experience by fostering smart, efficient business transactions and enhancing end-to-end communications between stakeholders in the waste ecosystem. The app facilitates interaction between stakeholders in the waste sector and users can enjoy a simple onboarding process, scheduled recyclable waste pickup, connection to the nearest waste recycler/collectors, values for every recyclable waste collected.

Collectors

Collectors are on the lowest rung of the recycling value chain: materials are sourced directly from end users and recovered items are sold to aggregators for further processing. Collector amasses less than 5 Tons of recyclable materials monthly. Materials collected at this point are a variety of different materials such as carton, plastics, and metals which are sorted into their categories before they are sold to aggregators.

Aggregators

The aggregators receive the collected and recovered recycled materials from the collectors and deliver them to the pre-processors/processors. Aggregation requires ample space for sorting and storage of recyclable materials. For example,



FIGURE 13 PICTURE OF RECYCLING AGGREGATION

Polyethylene terephthalate, PET vary in colours, the bottles also come with the caps and labels which are often different material from the bottles. The aggregator is mostly responsible for de-labelling, de-capping and bailing prior to the materials being sent to the pre-processors/aggregators. Aggregators target a category of material, e.g., PET, PP, paper or metal etc.

Pre-Processors

Pre-processors add value to recyclable materials before selling them to off-takers for processing into finished products. Pre-processors focus on a single recyclable material due to the capital intensity of the investment. Aggregators supply pre-processors according to preference: a pre-processor may request bulk post-consumer bottles with caps and labels or baled post-consumer bottles. Pre-processing, depending on the reference material, includes further operations (sorting, cleaning, crushing, grinding, pelletizing, production of ingots, production of billets, production of base oil, etc).



FIGURE 14 RECYCLING PREPROCESSING

Processors

Recycling processors convert recyclable waste materials into new products either of the same form as the parent material or into other forms. The materials collected from the collector, aggregator or pre-processor end up at the processors as feedstock and are converted to new materials.



FIGURE 15 RECYCLING PROCESSING ACTIVITIES

Upcyclers

Upcycling is a form of waste craft that transforms waste materials into products of a higher value than the original item. Upcyclers are involved in the act of using materials that are no longer in use and giving it a second life and new function.



FIGURE 16 PICTURE OF UPCYCLED PRODUCTS

4.2.1 WASTE CONVERSION

Waste conversion technologies (WCTs) are non-incineration technologies that are used to convert the non-recyclable portion of the municipal solid waste stream to electricity, fuels, and/or industrial chemical feedstocks. The potential for addressing renewable energy mandates and green jobs initiatives as well as meeting local solid waste management needs had seen rising interest in the demonstration and commercialization of WCTs.

Composting

There are many benefits to reusing and recycling green waste: composting provides you with a valuable soil fertilizer, it reduces disposal costs while also creating a valuable usable product and it is a natural method of processing material which would otherwise be landfilled. Turning green waste into compost reduces environmentally harmful gases. Green waste that is landfilled decomposes without the presence of oxygen, producing methane gas, a potent contributor to global climate change.



FIGURE 17 PICTURE OF THE COMPOST FACILITY

Biogas Production

Biogas is a naturally occurring product of breakdown of organic material such as food and agricultural waste, in the absence of oxygen, referred to as anaerobic digestion. The gas consists of methane, carbon dioxide and hydrogen sulphide. To ensure that biogas is safe for use, it is produced in a controlled environment and scrubbed to remove the

hydrogen sulphide. Biogas can be good replacement for fuel in vehicles, for burning and for powering generators to produce electricity.

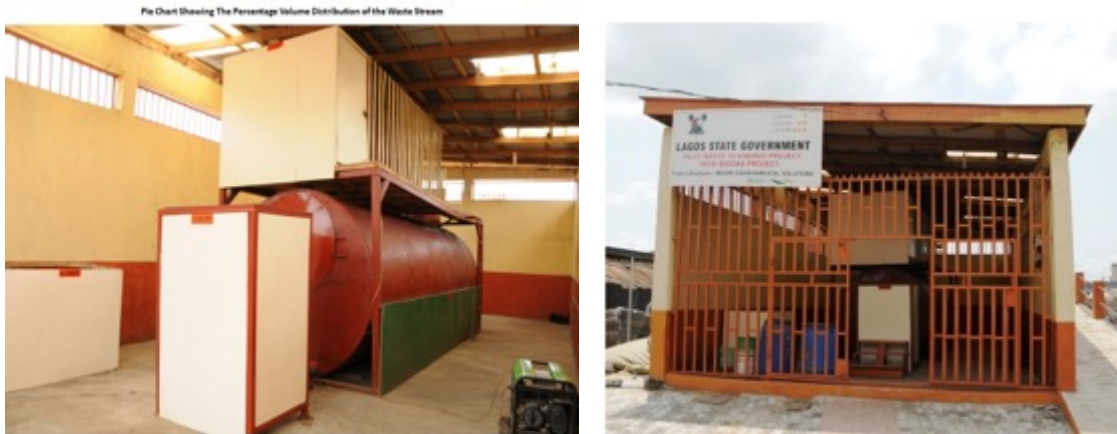


FIGURE 18 BIOGAS PRODUCTION FACTORY

Co-Processors

Co-processing is being utilized especially by cement manufacturers as a source of energy or replacement of conventional fuel for firing of cement kiln. The residue from the process goes into the production as feedstock. Co- processing reduces dependency on natural source of fuel and increases diversion from landfill leading to the extension of the lifespan of the landfill.

4.2.2 WASTE ENGINEERING/FABRICATORS

Waste Management is an extensive sector that incorporates diverse skilled professionals to function optimally. Managing waste entails uses of equipment to drive efficiency and effectiveness of the system. Equipment and machines used in the WMS includes, but is not limited to, compactors, bins, bailers, pelletizers, extruders, etc. This equipment and machines are serviced, maintained or replaced at interval and this is carried out by the waste engineering or fabrication section.



FIGURE 19 PICTURE OF LAWMA MAINTENANCE SECTION

4.2.3 GOVERNMENT/POLICY MAKERS

Policy maker are government institutions responsible for policy formulation, implementation and enforcement to ensure compliance to environmental regulations and standards. Some of the major policy makers in the waste management industry in Lagos are highlighted below.

Lagos Waste Management Authority (LAWMA)

LAWMA is the Government Agency statutorily charged with the management of solid waste in Lagos State. The role of LAWMA includes policy implementation, advocacy, monitoring and enforcement of sanitation law. Thus, LAWMA handles and sets the regulations for the collection, transportation, treatment, disposal and general handling of solid waste generated from different sources within the Lagos precincts such as: households, markets, industries, commercial locations, offices, schools, highways, healthcare facilities, laboratories, as well as construction, demolition and disaster sites.

Lagos State Ministry of Environment and Water Resources (MOE&WR)

The Lagos State Ministry of the Environment and Water Resources is primarily responsible for securing a clean, healthy and sustainable environment in Lagos State. The ministry is the overall policy formulator on environmental issues in the State and solid waste management being a very important component of the environment sector is prioritized and LAWMA is one of the Agencies under the supervision of the Ministry.

Federal Ministry Of Environment

The Federal Ministry of Environment is saddled with the mandate to address environmental issues and also ensure effective coordination of all environment matters in the country. The ministry is responsible for various roles including national goals of desertification and deforestation, pollution and waste management.

Lagos State Environmental Protection Agency (LASEPA)

The Lagos State Environmental Protection Agency (LASEPA) is the agency responsible for noise and air pollution control.

Lagos State Wastewater Management Office (LSWMO)

The Lagos State Wastewater Management Office (LSWMO) is the implementing agency for all wastewater management matters in the State. The mandate of the Office covers the implementation of policies, plans, programmes and projects on sewage and septage management in the State. The responsibility encompasses the management of the generation, collection, transportation, treatment and disposal of wastewater in order to ensure the discharge of permissible and adequately treated effluent into the environment.

The Ministry of Women Affairs And Poverty Alleviation (WAPA)

The Ministry of Women Affairs and Poverty Alleviation (WAPA) formerly the Department of Women and Children in the Ministry of Youths, Sports and Social Welfare. is an agency of the Lagos State Government that focuses on remediation and empowerment of women, the vulnerable and children. WAPA, through the NGO unit, offers Grants-in Aid to women focused Non-Governmental Organizations (NGOs) as support and motivation for their various empowerment programmes in the State. They also organize capacity-building workshops for women focused NGOs to afford them the opportunities of networking for improved service delivery.

4.2.4 WASTE MANAGEMENT ASSOCIATIONS

These are group of people with similar operational activities coming together as a body to regulate and coordinate the work and serve as liaison institutions with the government and other external forces.

Association of Waste Managers of Nigeria (AWAMN)

This is an association of Private Sector Participants (PSPs) in Nigeria with their headquarters in Lagos State. Over 400 PSPs are engaged in waste collection and transportation in Lagos State and their investment into the WMS of the state is quite huge as members utilise about 900 refuse collection (compactor) trucks for waste collection and transportation.

Recyclers Associations

These are groups of recyclers and suppliers that came together to form an association. They participate in every aspect of the recycling value chain (they process recyclables to end products). Some of the Recyclers associations in Lagos State are:

- United Waste Recycling and Suppliers Association
- Dynamic Polymer
- LAGRA (Lagos Recyclers Association)
- NASWADEN (National Association of Scrap and Waste Dealers Employers of Nigeria)
- ACWREDON (Carton Association)
- ASWOL (Association of Scrap Waste Pickers of Lagos)
- Recyclers Association of Nigeria
-

Producer Responsibility Associations

- **FBRA** (Food Beverage Recycling Alliance) is the industry collaborative platform committed to mopping post-consumer wastes from the environment
- **EPRON** (E-Waste Producer Responsibility Organization of Nigeria) is a non-profit organization set up by electrical and electronic producers in Nigeria. It is the Producer Responsibility Organization (PRO) set up to implement the Extended Producer Responsibility policy and ensure the environmentally sound management of electronic waste (e-waste) in Nigeria

4.2.5 WASTE INSTITUTIONS

Waste institutions are group of professionals or professional bodies responsible for training, certification and coordination of waste management operations. Some waste institutions in Lagos are the following:

Waste Manager Society of Nigeria (WAMASON)

The Waste Management Society of Nigeria (WAMASON) is a non-governmental professional organization with a mandate to develop waste industries and practice to protect public health, control pollution and to conserve ecological resources.

The Nigerian Environmental Society (NES)

The Nigerian Environmental Society (NES) is a professional, non-profit, non-governmental body which is committed to advocacy and actions towards environmental protection, sustainable environmental development and promotion of environmental professionalism within Nigeria and in the global arena. It is recognized as the premier environmental society and watchdog of the environment in Nigeria.

4.3 WASTE MANAGEMENT IN GHANA (ACCRA AND KUMASI)

The Accra Metropolitan Assembly (AMA) is the local government authority of the city of Accra. AMA is responsible for the general administration of the city, provision of social services, provision of infrastructure for economic and social activities and environmental services. The waste management department is responsible for the development and implementation of waste management plans including the maintenance of infrastructure. All the waste disposal sites in Accra have been closed, so there is no disposal site within the city. All the waste collected in the city is transported to a landfill in Tema which is 37 kilometers away from Accra. Therefore, the waste management companies in Accra collect waste within the city and dispose of them to Tema, leading to high cost of garbage collection.

Solid Waste Management

Waste management is the responsibilities of local government authorities (District, Municipal and Metropolitan Assemblies) vide Local Governance Act 936 -2016).

Solid Waste Generation

Estimated SWM generation in Accra is 1800 tons per day. The top waste fractions by weight are organic and plastic at 53% and 16% respectively.

Waste Storage

Waste is stored in plastic and metallic containers ranging from 60 to 360 liters at the household level. At communal refuse collection sites, waste from households is dumped in containers with volumes between 10 and 23 cubic meters. The AMA sanitation bye-laws require households to acquire bins for refuse storage and collection.

Collection Of Municipal Solid Waste

Accra is yet to implement a city-wide source separation programme so mixed waste is collected from almost all premises (residential, commercial, institutional, etc.). Solid waste collection has been assigned to 7 private service providers in 9 service zones on franchise. Service providers collect waste and corresponding charges from service beneficiaries. Common method of collection is door-to-door collection of waste from communal sites and public places has been assigned to a private company Zoomlion Ghana Limited and the central government pays for such service. Waste collection in low income and marginalized communities is mostly done by informal waste collectors. Informal collectors are responsible for collection of over 70% of waste in such communities. Informal waste collectors do not have contracts with the city although their activities are recognized by city authorities.

E-Waste

Currently, there is no regulation on e-waste collection at city level. Informal collectors, mostly migrants, buy e-waste from households and recover valuables that they sell to middlemen for onward sale and further processing. Residues after dismantling are disposed of in water bodies and open spaces.

Medical Waste

Management of healthcare waste is regulated by the Ghana Health Services' "Guidelines on Management of Health Care Waste".

Treatment

Currently, there are two compost facilities that receive waste from Accra and adjoining municipalities. The combined capacity of both facilities is approximately 2000 tons per day, however current production is less than 60% of installed capacity.

Plastic Waste Management

Ghana is one of the nations affected by the plastic waste. It has therefore shifted its focus to waste recycling. Ghana is one of the top industrialized countries in Africa hence facing significant waste pollution that requires effective management. Some of the waste materials are recyclable into useful products which are friendly to the environment. Some waste management companies have shifted their focus to recycling the wastes. The companies are categorized according to the type of waste materials they are handling. There are millions of tons of plastic waste being released to the environment by various households which need to be managed to maintain garbage at manageable levels.

4.3.1 RECYCLING AND DISPOSAL

Recycling in Accra is over 80% informal. Informal recyclers buy recyclable plastics from waste pickers and process them into pellets, flakes and sell to manufacturers as raw material for plastic products and export. PET bottles are compacted or flaked for export. Over 85% of Accra's MSW is disposed of through landfilling. Currently, there are two disposal sites available, both outside the city. The available disposal sites are not sanitary landfills although one is a remedial dumpsite. The round trips to these sites are more than 70 km.

4.4 PUBLIC AUTHORITIES

The Ministry of Sanitation and Water Resources

The Ministry of Local Government and Rural Development and the Ministry of Sanitation and Water Resources are responsible for policies in the waste sector. The Environmental Sanitation Policy published by the Ministry of Local Government and Rural Development in 2010 is the policy guidance for waste management in Ghana. The local Governance Act 936, 2016 mandates local authorities to be responsible for sanitation and waste management. The roles of waste management departments are defined in the Act.

The Environmental Protection Authority

The Environmental Protection Authority are regulators of the environment sector. The authority has guidelines that regulate activities like construction of waste infrastructure, development of waste management plans etc. by municipalities.

4.5 KEY STAKEHOLDERS IN THE WASTE MANAGEMENT INDUSTRY OF GHANA

1. INFORMAL WASTE GROUPS

- a. Plastic Waste Pickers Association
- b. Tricycle Operators Association
- c. Accra Metro Informal Waste Collectors Cooperative
- d. National Plastic Recyclers Association

2. RECYCLING COMPANIES

- a. Pyramid Plastics
- b. Universal Plastic Products Limited
- c. Blowplast Ghana Limited

3. WASTE COLLECTION COMPANIES

- a. Liberty Waste Limited
- b. Zoomlion Ghana Limited
- c. J. Stanley Owusu and Co Limited
- d. Kobby Waste Limited
- e. Asadu Royal Seed Limited
- f. Meskworld Company Limited

4. NON-PROFIT ORGANISATIONS

- a. Green Africa Youth Organisation
- b. Footprint Africa
- c. People's Dialogue
- d. Won Bei Ga (Cleaning Accra)

KUMASI WASTE MANAGEMENT LIMITED

Kumasi Waste Management Limited was established in 2000 to complement Kumasi Metropolitan Assembly's (KMA) efforts to improve sanitation in the region. It was the first privately owned Ghanaian company to start Waste management operations in the Metropolis. Since its inception, the company has been actively engaged in solid waste collection and evacuation. This project started in the Kumasi Metropolis and later extended to other selected zones and communities.

JSO

As a result of J Stanley-Owusu's (JSO) technical expertise and capability, the Kumasi Metropolitan Assembly then contracted JSO to operate and manage the biggest and only engineered landfill and sewerage treatment plant in the country, constructed by the World Bank. For this contract JSO was a pioneer in the private sector participation programme.

Main activities of Kumasi Waste Management Limited are:

- Domestic house-to-house collection;
- Industrial and institutional collections;
- Medical and similar hazardous waste.

4.6 KEY WASTE MANAGEMENT CHALLENGES IN LAGOS STATE, ACCRA AND KUMASI

In spite of efforts put in place by the Lagos State Government and the Ghana to evolve an efficient solid waste management system, the sector is still being suppressed by some critical issues like:

- **Increasing waste quantities due to increase in population and urbanization;**
- **Influx of unaccredited informal waste collectors;**
- **Citizens' low income/poverty index;**
- **Inadequate Funding:** an element playing a major role with regards to the efficiency of the waste management service is the availability of funds, whereby their adequacy and timeliness often determine the success or failure of the responsible agency. The World Bank recommended budgetary provision for solid waste in developed countries, which are believed to have adequate infrastructure should be about 10% of Monthly Recurrent Expenditure. Whereas, it is 15% for less developed countries, including Nigeria, based on the premise that such countries have poor infrastructure bases which need to be improved to address the situation. Lagos is yet to achieve a 10% budgetary allocation for waste management;
- **Inadequate Infrastructure:** this is closely related to availability of funds. The demand gap is worsened with rapid population growth and housing demand, limited land space, technology and so on;
- **Socio-Cultural/Socio-Economic Issues:** among which is the unwillingness to Pay for a waste service which is considered as the social responsibility of State/Local Government. Also challenging is the poor attitude to modern waste management strategies (reduce, reuse and recover), poverty rate and inability to pay for waste service by a sizable number of residents who live in the slums and low-income areas of the state;
- **Not-in-my-backyard (NIMBY) Syndrome:** the state has not been able to make headway with contemporary waste management infrastructures like sanitary landfill sites, TLSs and other waste-to-wealth/energy facilities because people vehemently disapprove the establishment of waste management facilities in their close proximity and the State do not have the luxury of virgin or unutilized spaces;
- **Fair Public Enlightenment:** despite intensified and extended publicities of best practices in solid waste management, compliance is still at its lowest ebb and awareness and advocacy yield minimal desired results. LAWMA champions, pioneers and explores various media to continue to educate the Lagos public as well as publicize the State Government's expectations from the populace in the area of SWM. However, at the minimum, people still litter the streets and dump refuse, indiscriminately;
- **Weak and Inadequate Human Capital Index:** the required technical and research support service for implementing acceptable waste management projects is still grossly deficient (quantity and quality). Also posing a challenge is the paucity of expertise in modern waste management processes;
- **Low Technological Advancement:** existing technologies (methods and equipment) are too low for the handling of the volume, rate and complexity of the current waste generation while the appropriate ones are more sophisticated or rather expensive for local adaptation, use and maintenance. Especially for the purpose of implementing and sustaining modern (best practice) waste management strategies like waste reuse, recovery, recycling and renewable energy.

5. SKILL GAP ANALYSIS

The skill gap analysis in the WMS both in Lagos and Ghana (Accra and Kumasi) was carried out using quantitative and qualitative research methodologies (desk review, questionnaires, focus group discussion) as detailed below.

5.1 DESK REVIEW

This is an important step that involves gathering and analysing information from secondary sources such as published reports, databases, and online sources. The purpose of desk research is to provide a comprehensive overview of the current state of the waste management industry in Lagos, Accra and Kumasi, including the skills required and the existing gaps in those skills. The desk review helped to achieve the outputs described in the following paragraphs.

Identify Current and Future Trends

This includes changes in technology, regulations, and market demand. By understanding these trends, we are able to identify the skills that will be required eventually.

Understanding the Skills Required

The desk research helps to identify the skills required for different roles in the WMS. This includes technical skills, such as knowledge of waste treatment technologies, as well as soft skills, such as communication and teamwork. By understanding the specific skills required for each role, it will be easy to design targeted training programs.

Identifying Skill Gaps

The desk research also helps us to identify the gaps in the skills currently available in the WMS. This includes areas where there are shortages of workers with specific skills or where there are skills that are no longer relevant.

5.2 STAKEHOLDERS IDENTIFICATION AND MAPPING

Stakeholder identification and mapping is crucial and helps in identifying different stakeholders involved in the WMS, their roles, interests, and influence. It helps to determine the impact of the stakeholders on the sector and how they can contribute to addressing the skill gaps. It also helps to identify and prioritize the different stakeholders involved in the sector, their knowledge, skills and capacity gaps. This is to ensure their interests and concerns are considered in policy development and to develop appropriate strategies to address the skill gaps. The different stakeholders across the waste management value chain (collection, transportation, treatment and disposal) identified are:

5.3 QUANTITATIVE RESEARCH

Questionnaire

For the skill gap analysis, the quantitative research approaches used are survey and questionnaire to obtain data on the current skill levels of workers, the magnitude of skill gaps, and the factors that contribute to the gaps. The aim was to get a systematic and objective approach to understanding the extent of the gap, identifying the specific areas where skill shortages exist, assessing the level of workforce competence, and identifying the training needs of the industry. **Questionnaires** were administered online (using the KoboToolBox open source tool) to stakeholders in the recycling value chain and policymakers in the WMS (See Annex C and Annex D).

5.4 QUALITATIVE RESEARCH

The qualitative research approach used for this study is a Focus Group Discussion (FGD) to get a deeper understanding of the experiences, attitudes, and perceptions of stakeholders involved in the sector. This also helps to identify the underlying reasons for skill gaps and the social and cultural factors that contribute to them.

A **focus group discussion** is an important tool in the skill gap analysis given the following reasons:

- **It gives In-depth insights:** Focus group discussions allow more in-depth insights into the attitudes, beliefs, and experiences of employees and other stakeholders in the WMS. This helps to identify factors that contribute to the skill gaps, such as gaps in training, lack of resources, or cultural barriers;
- **Multiple perspectives:** The Focus group discussion helps us to get different viewpoints to the skill gap identification and analysis. This provides a range of perspectives on the skills assessment in the sector which helps to identify common themes or issues that may not have been apparent from individual interviews;
- **Interaction:** It provides a forum for interaction and discussion among participants, which helps generate new ideas and insights that were not captured from individual interviews or surveys;
- **Efficient:** It was relatively efficient compared to individual interviews, as it allows the collection of data from multiple participants in a shorter amount of time;
- **Cost-effective and Less Time Consuming:** It is more cost-effective because it involves multiple participants at once.

The focus group discussion was used to gather insights into the specific skills and knowledge areas that are lacking among employees, as well as the factors that contribute to these skill gaps. It explores the types of training and resources that are currently available to employees, as well as any barriers that may prevent them from accessing these resources which will be used to develop targeted training programs or other interventions to address skill gaps in this sector. The need analysis made a valid use of a combination of both quantitative and qualitative research methods to provide a comprehensive understanding of skill gaps in the WMS.

TABLE 2 SUMMARY OF THE RESEARCH METHODOLOGIES USED FOR THE SKILL GAP ANALYSIS

S/N	RESEARCH APPROACH	DESCRIPTION
1	Carry out an in-depth research in the waste management business segments	Desk review of the WMS to identify the different stakeholders
2	Categorization of identified stakeholders	Grouping of stakeholders into sectors (private, public, government/policy makers, informal)

3	<p>Quantitative Research The quantitative analysis used in this study included: Surveys, Performance metrics, and Questionnaire.</p>	<p>This is an important tool that allows the identification and measurement of gaps in employee skills and knowledge.</p> <p>This was used to gather data on the skills and knowledge of employees in the waste sector. Employee performance in specific areas such as productivity was tracked and this was very helpful to categorize the recyclers</p> <p>Helps to provide insights into the current skills and knowledge of employees, identify areas where additional training or up-skilling is needed, and help plan and design training and development programs</p> <p>Quantitative analysis helps us to provide objective data on the skills and knowledge of employees that can be used to identify gaps in skills and knowledge that need to be addressed, to develop targeted training and development programs to address these gaps and to translate information obtained into insights.</p>
4	Qualitative Analysis	<p>Helps to obtain deep insights from stakeholders by one on one interaction to understand their operations, skills, thoughts, feelings and challenges. It is non-numerical data collected through open-ended questions that allow participants to provide detailed and nuanced responses. The qualitative research method used in this study is a focus group discussion with stakeholders.</p>
5	The focus group discussion	<p>This helps to gather insights into the specific skills and knowledge areas that are lacking in the WMS, the training needs, factors that contribute to these skill gaps. Available resources and barriers that prevent them from accessing these resources.</p>
6	Skill gap analysis	<p>This involves identifying the specific skills that are needed in the waste management sector and the gaps that currently exist. This will be done by analysing the identified stakeholders, their job descriptions, technology used, skills assessment, performance review and so on by talking to industry experts, analysing the questionnaires and reviewing the outcome of the focus group discussion. Skill gaps will be identified by comparing the required skills with the current skills of employees and identifying areas where there are gaps.</p>
7	Visual Mapping of the skill gap analysis	<p>This will help to identify training needs and development programs that will help employees acquire the required skills, provide opportunities for on-the-job learning and mentoring.</p>

5.5

5.6 RESPONDENTS PROFILE

A total of 100 people responded to the questionnaire on vocational skill gaps in the WMS in Lagos and Ghana. Respondents are stakeholders and policy makers in the waste management sectors of both cities. The results were analysed based on the three sections as followed:

- Questionnaire for Policy Makers
 - SECTION A: General Bio-data information;
 - SECTION B: Questions for policy makers.
- Questionnaire for Stakeholders in the Waste Sector
 - SECTION A: General Bio-data information;
 - SECTION B: Questions for key players in the WMS (stakeholders).

5.6.1 ANALYSIS OF THE DATA

Questionnaires were administered to 100 respondents of which 62 were male, 37 were female and 1 respondent preferred not to say his/her gender.

The responses also cut across different fields in the waste management space like waste collection, haulage and processing, plastic and organic waste recycling to waste tech companies, consultants, engineers and policy makers. The data as seen from figure 2 to 5 shows 35% of respondents are from the General Waste Collectors (called PSPs) while 34% are from the recycling space. A quarter of respondents are policy makers while 6% represent other fields like tech companies, consultants, etc. This also shows a willingness to participate in the study from all fields in the WMS.

- Plastic waste collectors are highest (6) with E-waste and other recycling collectors having 3 responses each.



FIGURE 20 SHOWS DATA OF THE VARIOUS RECYCLABLE COLLECTORS

The figure below shows the spread of recycling processors in the survey. Aggregators and Pre-processors have the highest number of response (14) while there were responses from upcyclers, compost facilities, plastic waste conversion facilities, and other recycling waste processors.

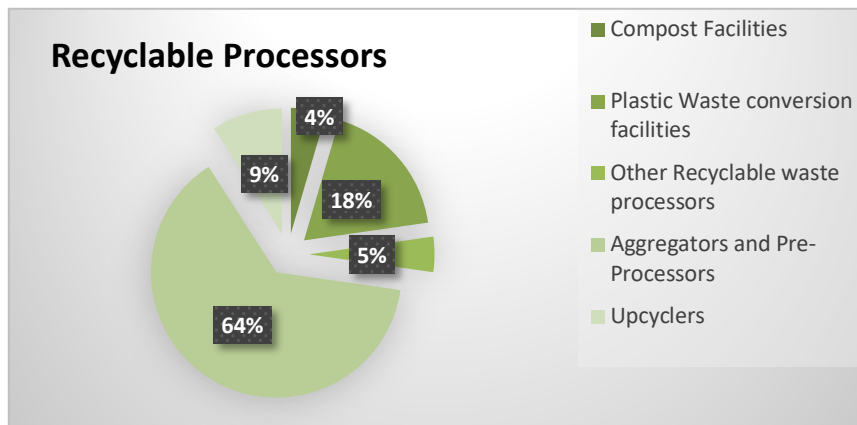


FIGURE 21 SHOWING DISTRIBUTION OF RECYCLABLE PROCESSORS

The figure below shows responses from other players in the solid WMS like policy makers, waste tech companies, consultants, engineering services and others:

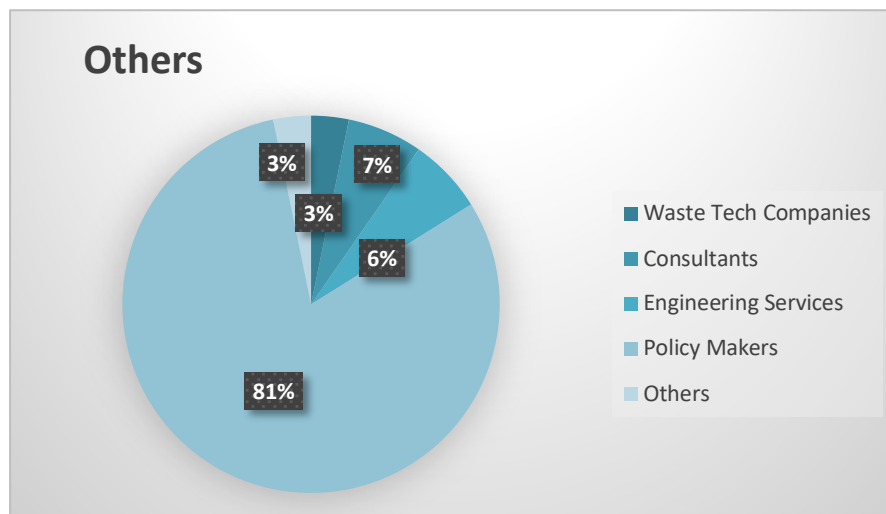


FIGURE 22 SHOWS RESPONSES OF OTHER PLAYERS IN WASTE MANAGEMENT

- Moreover, more responses from stakeholders in the private sector (63) than from the public one with only 37 respondents.

This graph shows the distribution of stakeholders who possess vocational or technical skill in waste management: 68% of respondents indicated that they possess vocational or technical skills, while 31% of respondents have no vocational or technical skill. From the figure, we understand that there is at least double the number of people who possess vocational/technical skill over those who do not possess any vocation and technical skills. This indicate that there is quite an amount of people with technical expertise in the sector.

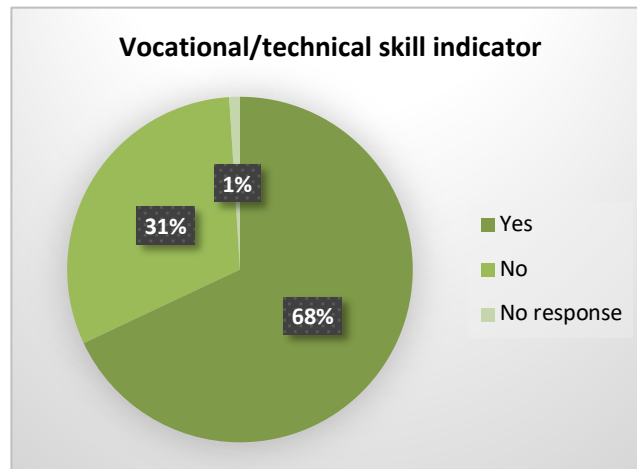


FIGURE 23 VOCATIONAL/TECHNICAL SKILL INDICATOR

Figure 24 shows the stakeholders' response on whether they have sufficient skilled labour to work in their facilities. 43 respondents indicated yes to having sufficient skilled manpower, while 29 respondents indicated that they do not have sufficient skilled manpower to operate in their facilities. This number may be high because the majority of the work is done especially by collectors and aggregators with the highest number of respondents on one side, though requiring minimal skills to get the job done on the other.

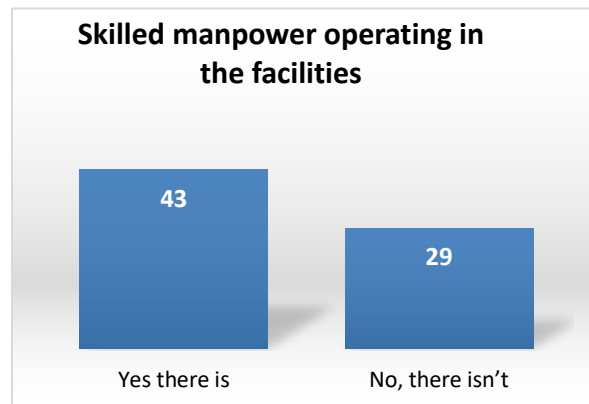


FIGURE 24 SKILLED MANPOWER OPERATING IN THE FACIL

Figure 25 shows the number of trained and untrained staff by waste management stakeholders. From the table, it can be seen that over 86% of the stakeholders train their staff.

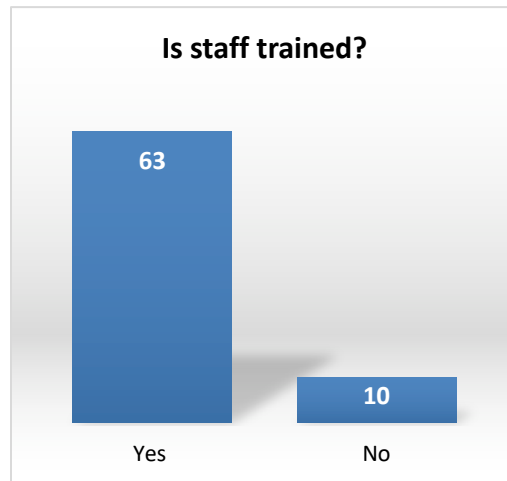


FIGURE 25 RESPONSES: IS STAFF TRAINED?

Figure 26 shows the response of waste management stakeholders on the type of staff training. Over 86% of the stakeholders train their staff and the training offered is mostly technical in nature (48% technical training) while they also offer managerial (27%) and vocational (25%) trainings.

From figure 27, frequency of these trainings also varies from monthly (35%), quarterly (45%), bi-annually (7%) and

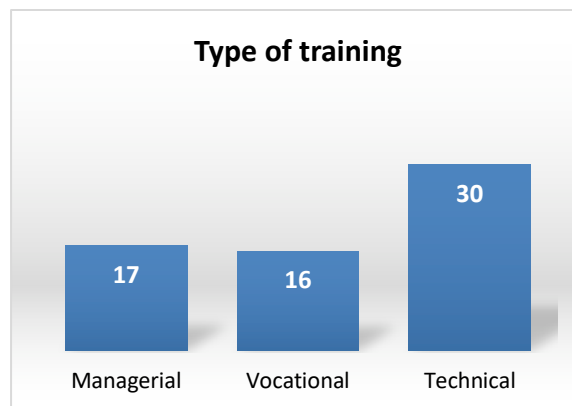


FIGURE 26 TYPE OF TRAINING

annually (13%). It is important to note that the survey does not take into consideration the quality of these training sessions or the increase in productivity and skill after these training sessions. Also, different kinds of training may be organized by the same organization at different times.

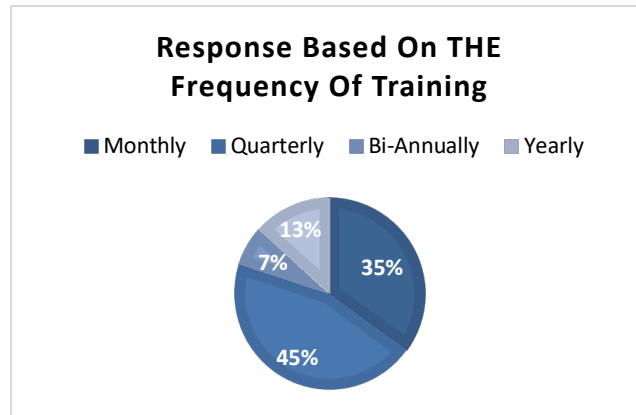


FIGURE 27 FREQUENCY OF TRAINING

71% of respondents admit to have operational challenges due to insufficient skilled manpower. This is further proof that although the workers are trained, the quality of training may not be sufficient to surmount the operational challenges. 99% of respondents showed an interest in participating in vocational training. On if there are necessary skills to drive the waste management industry; there was a fairly even response between policy makers with 46% agreeing that there are necessary skills and 54% with a negative response as indicated. This may indicate that while there are skills, there may be a need for more skill acquisition to further drive the industry. Moreover, policy makers are divided when it comes to availability of vocational training centers: 50% say that vocational training centers are available while 50% disagree. The response to the above question indicates that although there are few regulated vocational training centers, the majority of these centers are not regulated. On whether vocational training centers offer waste management courses, most policy makers disagree on this while 25% agree that vocational training centers offer waste management courses. Policy makers were asked if there are plans to establish a waste vocational center. They did not conclusively respond negatively, but they were majorly unsure (about 59%), while 41% affirmed that there are coherent plans in place (Figure 36). Policy makers were asked if they train the sectors they regulate: the major response was yes - 76% (19 out of a total of 25 respondents).

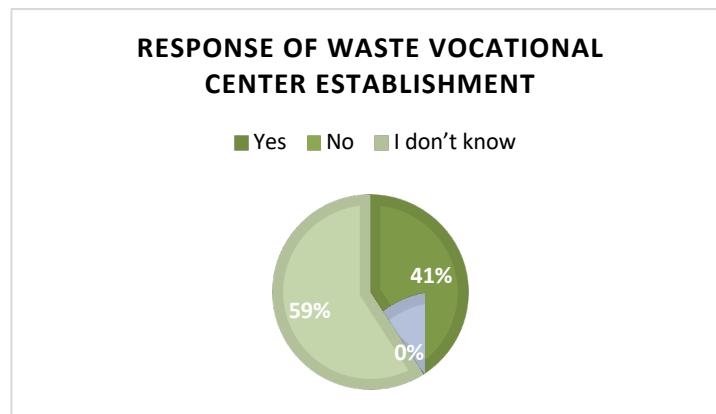


FIGURE 28 RESPONSE OF WASTE VOCATIONAL CENTER ESTABLISHMENT

Answers on frequency of training vary but responses indicate that training is usually conducted quarterly, i.e. 31% (Figure 19).

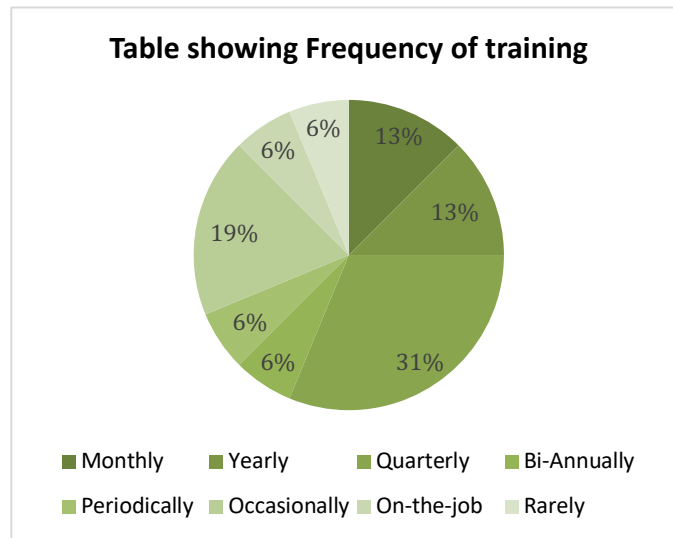


FIGURE 29 TABLE SHOWING FREQUENCY OF TRAINING

Government, through its policy makers, is making plans to strengthen stakeholders and make the sector more viable and valuable.

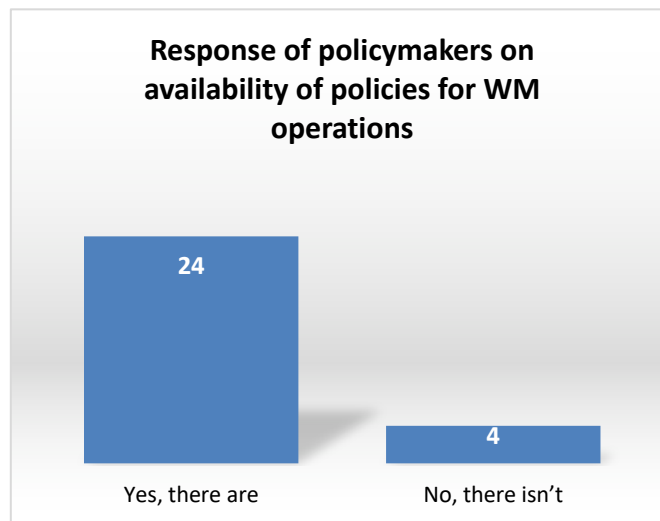


FIGURE 30 RESPONSE OF POLICYMAKERS ON AVAILABILITY OF POLICIES FOR WM OPERATIONS

Figure 30 shows response on policy review to meet up with current and emerging trends in waste management. This is a clear indicator that policy reviews are reactive rather than proactive because most policy reviews occur only when there is a need for it and only very few times (4% occurrence) does it occur often (without a need driving it).

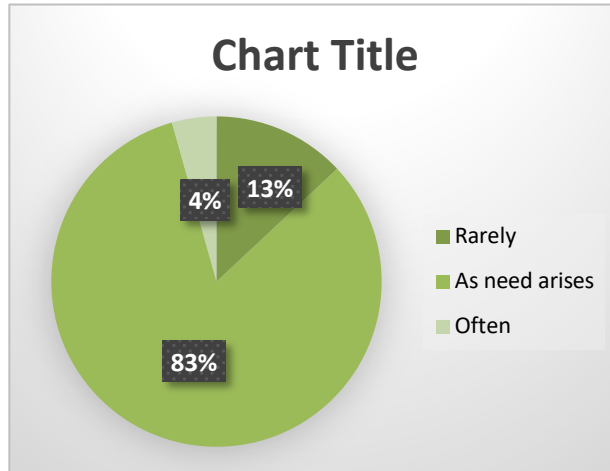


FIGURE 31 FREQUENCY OF POLICY REVIEW TO MEET UP WITH CURRENT TRENDS

5.7 QUALITATIVE ANALYSIS

5.7.1 RESULT OF FOCUS GROUP DISCUSSION

Following the administering, analysis and interpretation of the questionnaires, a focus group discussion was organised to bring all the stakeholders together. The platform gives them the opportunity to rub minds together and discuss operational challenges encountered on the job as well as proffer likely solutions to these challenges. The findings from the focus group highlighted current gaps in the industry and identifies the skills that are most needed to ensure a sustainable and effective Green Waste Management supply chain.

5.7.2 OBJECTIVES

The focus group discussion had the following objectives:

- To validate data obtained from desktop review and the quantitative analysis (questionnaire)
- To directly engage key players in the waste management industry in Nigeria and Ghana
- To obtain qualitative data on skill gaps from identified stakeholders
- To analyse the current training and development programs available to professionals in the Green Waste Management supply chain in Ghana and Nigeria
- To explore potential solutions to address the skills gap in the Green Waste Management supply chain in Ghana and Nigeria
- To provide structured report of Demand/Supply gaps in green waste management skills
- To obtain data that will help to develop curriculum designs for training courses and business training programs totally focused on deficiencies, demands and on improving the competitiveness of industry, micro, small and medium businesses

5.7.3 HIGHLIGHTED CHALLENGES FROM THE FOCUS GROUP DISCUSSION

Stakeholders

- Lack of skilled workers, particularly at the bottom and middle levels of the pyramid due to Low level of education;
- Need for better quality control measures, as the industry struggles with the quality of recycled products;
- Need for effective skill acquisition to address the skill gap in recycling and waste management in Lagos and Nigeria as a whole;
- Need to train people at all levels of the value chain, including at polytechnics, colleges of education, secondary schools, and sorting areas;
- Need for locally fabricated machines for recycling;
- Need to engage young people in developing skills to reduce youth-related problems;
- The challenge of sorting waste categories and stakeholders in the value chain;
- The importance of composting and the need to invest in organic waste sorting and recycling;
- Need to address energy generation from composting and the reduction of food waste at the source;
- Inadequate segregation of organic waste from general waste by households and businesses;
- Limited access to waste collection in informal settlements and low-income communities;
- Lack of skills and use of crude methods by informal waste workers;
- Limited access to financial and social services for informal waste workers;
- Insufficient tailored training for informal waste workers.

Policy Makers

- Cost of production i.e. increasing cost of diesel, spare parts inflation/exchange rate;
- Poor public participation in acceptable solid waste management standard, i.e. sorting of waste and waste containerization;
- Indiscriminate dumping of plastics in the ocean and sea pose great danger to human health;
- Citizens unwillingness to pay for waste services;
- Slum settlements and poor ability to pay for waste service in such an area;
- Capacity challenge faced by PSP operators;
- Indiscriminate burning of unwanted materials or waste;
- A buildup of solid waste promotes the breeding of rats, flies and mosquitoes, all of which will cause the spread of disease;
- Lack of space for storing recyclables;
- Inadequate infrastructure;
- Low public awareness;
- Inadequate funding (Accra, Ghana);
- Low public participation (Accra, Ghana);
- Poor waste collection (Accra, Ghana);
- Inadequate infrastructure (Kumasi, Ghana);
- Poor waste collection (Kumasi, Ghana);
- Low public awareness (Kumasi, Ghana).

Challenges of Public Waste Collectors

- Cost of operation: increasing cost of Diesel, Spare Parts, Inflation/exchange rate;
- Poor public participation in acceptable solid waste management standards: sorting of waste and waste containerization;
- The indiscriminate dumping of plastics in the ocean and the sea pose great danger to human health because some of the chips from the plastics find their way into the belly of the fishes;
- Indiscriminate dumping of waste at unauthorised locations such as canals, gutters, road medians and uncompleted buildings;
- Citizens unwillingness to pay for waste service;

- Slum settlements and poor ability to pay for waste service in such areas;
- Capacity challenge faced by PSP operators and difficulty in getting.

Challenges of Recycling Collectors in the informal sector

- Indiscriminate burning of unwanted materials or waste to extract valuables can cause major air pollution and increase greenhouse emissions;
- A build-up of solid waste promotes the breeding of rats, flies and mosquitos, all of which will cause the spread of disease;
- Lack of space for storing recyclables.

5.7.4 PROPOSED SOLUTIONS TO IDENTIFIED CHALLENGES BY STAKEHOLDERS

- Skill development: there is a need to address the skill gap in the workforce by providing training and opportunities for people of all ages and backgrounds, including retirees;
- Engagement with technical schools: technical schools and colleges of education should be engaged to develop more rewarding programs and involve them in operations;
- Local fabrication of equipment: developing equipment locally can reduce the cost of importing them, and experts in universities can help build better balers for local use;
- Upcycling: advocating for upcycling waste materials to reduce the amount of waste that ends up in landfills, and developing the necessary skills to upcycle effectively;
- Prioritisation of composting and energy: prioritising composting and energy as interventions to improve efficiency in waste management. Composting can also reduce the amount of inorganic fertiliser that depletes the soil system, and thereby improves air quality;
- Advocating for more segregation of organic waste from general waste by households and businesses;
- Providing motorised tricycles to informal waste workers for waste collection in areas where regular collection vehicles cannot access;
- Organising capacity building programs such as seminars and workshops to improve skills of informal waste workers;
- Enrolling informal waste workers into the National Insurance Scheme and facilitating their enrollment into the national education system;

- Collaborating with private sector, CSOs, and NGOs to upgrade schools for workers, especially in the recycling sector, to recover more resources from the waste stream.

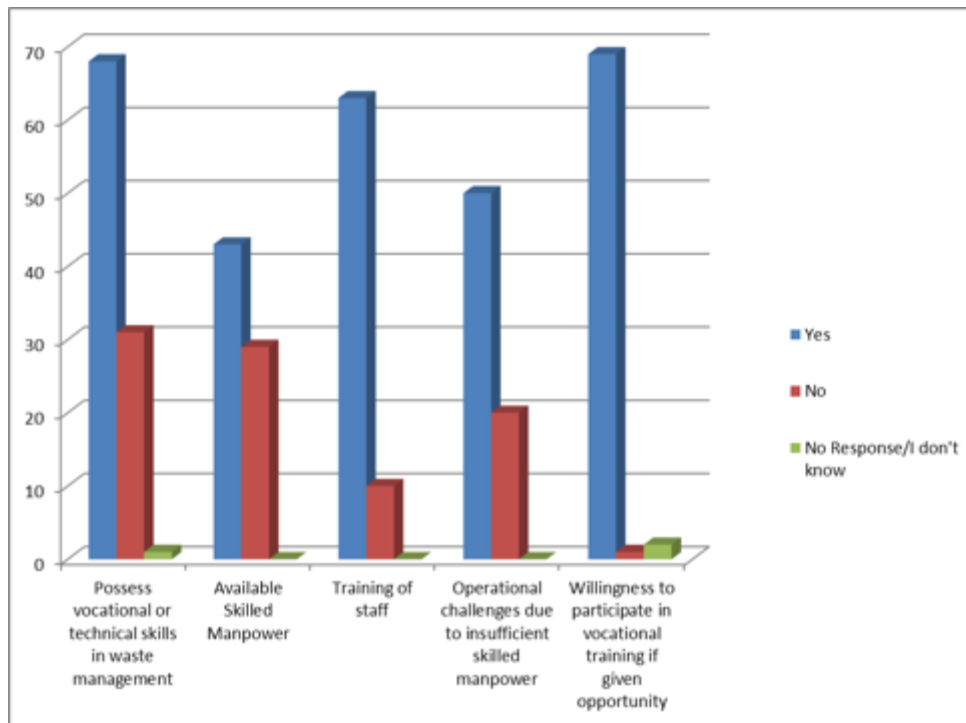


FIGURE 32 RELATIONSHIP BETWEEN RESPONSES OF STAKEHOLDERS TO SELECTED QUESTIONS

6. CONCLUSION

In conclusion, the key waste management challenges in Lagos State, Accra, and Kumasi include inadequate infrastructure, poor waste collection, low public awareness and participation, and inadequate funding. Addressing these challenges requires a coordinated approach involving all stakeholders, including the government, private sector, and citizens.

ANNEX A - STAKEHOLDERS IN THE SOLID WASTE VALUE CHAIN IN LAGOS

RECYCLING COLLECTORS

S/N	COMPANY NAME	LOCATION	CATEGORY
1	Nolzi Energy Limited	Agbara	Collection & Aggregation
2	African Cleanup Initiative	Ajegunle	Collection & Aggregation
3	Adetoro Bastor Ventures	Surulere	Collection & Aggregation
4	Lekki	Lekki	Collection & Aggregation
5	Excellent Brothers Nigeria	Ikorodu	Collection & Aggregation
6	Bluecycle Limited	Oniru	Collection & Aggregation
7	Ternion	Epe	Collection & Aggregation
8	Eilab Ikorodu	Ikorodu	Collection & Aggregation
9	Wrm Integrated Limited	Oyigbo	Collection & Aggregation
10	Upcycle Recycling Li,Mited	Ikorodu	Collection & Aggregation
11	Aje And Tayo Ventures	Isheri-Osun	Collection
12	Al-Falaah Pet And Logistics Service Ltd	Ikorodu	Collection
13	Green Space Depot	Ikorodu	PET Collection

AGGREGATORS

S/N	COMPANY NAME	LOCATION	CATEGORY
1	Horlag Recycling	Epe	Collection, sorting and baling
2	Procycle Cleaning Services	Agege	Collection and Aggregation
3	D'montegreene Ltd.	Isheri-Olofin	Collection, sorting and baling
4	Westman Recycling Ltd.		Collection, sorting and baling
5	Ecoplastic And Aluminium Recycling Services	Ojo	Collection, sorting and baling

6	The 8088 Recycling Ltd	Mushin	Collection and Aggregation
7	Medic Nigeria	Lekki	Collection and Aggregation
8	The Eco Recovery Management	Lekki	Collection and Aggregation
9	Planet Savers Global Limited	Ikorodu	Collection, sorting and baling
10	Street Waste Company Limited	Obalende	Collection and Aggregation
11	Oval Synergy Limited	Lekki	Collection and Aggregation
12	Mendes Olayinka Recyclables	Ikorodu	Collection and Aggregation
13	Greenhill Recycling Limited	Isolo	Collection, sorting and baling
14	Mechris-Planet Environmental Limited	Ikosi-Ketu	Collection and Aggregation
15	Od Aletinadav Nig Ltd	Ikorodu	Collection, sorting and baling
16	Plastic Solutions.Ng	Ogombo	Collection and Aggregation
17	Sweep Foundation	Surulere	Collection, sorting and baling
18	Bagaay Kind Limited	Shasha	Collection and Aggregation
19	Retreasure Global	Oba-Ogunji	Collection and Aggregation
20	Janirak Recycling Janirak Recycling	Badagry	Collection, sorting and baling
21	Trashusers Servicestrashusers Services	Yaba	Collection and Aggregation
22	Biostar Green Solutions Biostar Green Solut	Ipaja	Collection, sorting and baling
23	John Sixtwelvejohn Sixtwelve	Ajah	Collection and Aggregation
24	Waste Exchange	Oniru	Collection, sorting and baling
25	Recycle Exchange	Eti-Osa	Collection PET
26	Maladase Ecoprenuer Management Limited	Ikotun/Igando	Collection AI, Can and Carton
27	Loritem Recycling	Bariga	Collection
28	Kxrecycling Pty Ltd	Ikeja	Collection
29	Worldwide Dalom Trading Ventures	Ikorodu	Collection
30	Fumlak Ventures	Ikorodu	Collection
31	Mukhagim Global Services.	Ikorodu	Collection
32	Neatest Enviorment	Iju-Ishaga	Collection

33	Acwredon (Carton Association)	Across Lagos	Collection Carton
34	Francojuli Enterprises	Ikorodu	Collection PET, HDPE, LDPE Beverage
35	Ocean Clear Recyclers Limited	Ibeju-Lekki	Collection PET
36	Rio'jeevez Ltd Ikeja Collection	Ikeja	Collection
37	Wecyclers Nigeria Limited	Lagos Island	Collection and Baling
38	Nugida Enterprise Oshodi	Oshodi	Collection and Baling PET
39	Remould Global Ventures Limited	Ajah	Collection
40	Recyclepoints Limited	Festac And Ebute-Metta	Collection and Baling
41	Sahany Enterprises	Ikorodu	Collection and Baling
42	Kaltani	Lekki	Collection and Baling
43	Plastic Recycle	Ikoyi	Collection and Baling

PRE-PROCESSORS

S/N	Company Name	Location	CATEGORY
1	Zyntomax Ventures	Ikorodu	Pre-processing
2	Radhoka Global Private Limited	Ikorodu	PET Bottles to Flakes
3	Eco-Viridis Environmental Technology	Ogombo	Pre-processing
4	Solous Mrf	Igando	Collection, sorting and pre-processing
5	Hero Enterprise (Nig.)	Ikorodu	PE, PP Crushing
6	Black Earth Organics	Ikorodu	Organic Waste
7	Hero Enterprise (Nig.)	Ikorodu	Paper; PET; Beverage cans; Cartons; PV Organic Waste
8	Omotoke Olutayo Global Ventures	Ikorodu	IKORODU PET, HDPE, LDPE
9	Lanbak	Abeokuta Expressway	Paper; PET; HDPE; LDPE; Beverage cans; Cartons
10	Great Samolas Ventures	Ikorodu	Crushing of rubber, bata

	Isiu		
11	Rexos Recycling	Sangotedo	Crushing post-consumer PET plastics waste to PET flakes & sales of PP Caps. Sales of Post-industrial PET waste PET Lumps, PET preforms and PET chipping
12	Conversion Job Nigeria Ltd	Yaba	Paper; Cartons; E-waste; Organic Waste
13	Radhika Global Private Limited	Ikorodu	CRUSHING
14	Ola-Nof Recycling Enterprises	Ibeju-Lekki	CRUSHING
15	Recycling Experts Ltd	Apapa	PET Bottles
16	Mundo Africa	Aguda Surulere	Collection sorting and pre-processing
17	New Star Metals	Owode Oniri	Aluminium Ingot
18	Cbd Trading Limited	Ijesha	PET Crushing
19	Sahany Enterprise	Ikorodu	CRUSHING
20	Green Space	Ikorodu	CRUSHING (Hot washed flakes)
21	Top Polymer	Ikorodu	Crushing (Hot washed flakes)
22	Sonex	Ikorodu	Crushing (Hot washed flakes)

PROCESSORS

S/N	Company Name	CATEGORY
1	Unpacked Ltd	PET flakes recycling and manufacturing products with flakes
2	Salazar Enterprise, Lusada	Tyre to Light Pyrolysis Oil
3	Switch Recycling/Polysmart,	Bottle to Bottle
4	Iverest	Bricks from Plastics
5	Rida Plastics	Plastic Products
6	Givo	Plastic Products
7	Agboowa Briquette Facility	Sawdust to Briquettes

8	Alkem	PET to fiber
9	Bolous Paper	Paper Recycling
10	Top Steel	Metal Recycling
11	African Steel	Metal Recycling
12	Sunflag Steel	Metal Recycling
13	Purkit	Metal Recycling
14	Landcraft	Metal Recycling
15	Gandesereneables	Tire to light Pyrolysis oil

CONSULTANCY AND ADVOCACY

S/N	COMPANY NAME	LOCATION	CATEGORY
1	Taiwo Adewole And Associate	Across Lagos	Environmental Consultanc
2	Iccdi Africa	Yaba	Environmental Awareness Sustainability
3	Remould Global Ventures Limited	Ikosi - Ketu	Environmental Consultanc Recyclable Collection And Supplies

UPCYCLERS

S/N	COMPANY NAME	LOCATION	CATEGORY
1	Fabe International Foundation	Lekki	Upcycling & Collection
2	Why Waste It	Lagos Island	Textile upcycling to c beautiful art pieces
3	Planet 3r	Ibadan	Upcycling pure water sa into clothing, shoes, bag other materials

COMPOSTING FACILITIES

S/N	COMPANY NAME	LOCATION	CATEGORY
1	Earthcare Compost Facility	Ikorodu	Waste to Compost
2	Fabe	Victoria Island	Waste to Compost
3	Black Earth	Lagos Island	Waste to Compost
4	Waste 2 Table	Ikorodu	Waste to Compost

ANNEX B - WASTE MANAGEMENT INDUSTRIES IN GHANA

S/N	COMPANIES
1	Asadu Royal Waste Management
2	Universal Waste Concept
3	Zoompak Ghana Limited
4	J. Stanley-Owusu & Company Ltd.
5	Zesta Environmental
6	Erksarp Ventures
7	Y.N.O Enterprise
8	City Waste Management Co. Ltd.
9	BIOLAND LTD
10	New Era Waste Management Concept
11	Keen 2 Clean Services
12	Golden Falcon Company Limited
13	Early Sunrise Trading Co Ltd
14	PREMKO Waste Management
15	Asadu Royal Seed & Waste Management
16	3G plastic limited company
17	GP waste recycle co.Ltd
18	Universal royal paper limited
19	Polytex Ind.Ltd
20	Super paper product co.Ltd
21	Universal Waste Concept

ANNEX C - QUESTIONNAIRE FOR STAKEHOLDERS IN THE WASTE MANAGEMENT SECTOR

Tell us your name

Tell us your gender

- Male
 Female
 Prefer not to say

Which country do you reside?

What is your level of education?

- Primary
 Secondary
 HND
 BSC
 MSC
 PHD

Do you have any technical or vocational education in waste management?

- Yes
 No

Do you work in the waste management sector?

- Yes
 No

Do you work in a private or public organization?

- Public Organization
 Private Organization

How long have you worked in the waste management sector?

Tell us how many years you have been in the waste management sector

- Below 1 year
 1 -5 years
 6 - 10 years
 10 years and Above

What sector of the waste management business do you operate in?

How many employees are in your facility?

What technologies/equipment are used in your facility?

How do you source these Equipments/technologies?

- Locally
- Imported
- Both

If imported, do you have the required skills to fully operate and maintain them?

- Yes
- No

Do you have sufficient skilled manpower to operate your facility?

- Yes
- No

If Yes, please state the available skills deployed to operations

If No, what are the required skills in deficit?

Do you train your staff?

- Yes
- No

If Yes, what type of training?

- Managerial
- Technical
- Vocational

How often?

- Monthly
- Quaterly
- Bianually
- Yearly

What are the training needs required to fully optimize your operations?

Are there operational challenges attributed to lack or insufficient skilled manpower?

- Yes
- No

Please highlight them

Will you be willing to participate in vocational training if given the opportunity?

- Yes
 No

Please state any other comments to improve the skill gaps in your operations

ANNEX D- QUESTIONNAIRE FOR POLICY MAKERS IN THE WASTE MANAGEMENT SECTOR

30/05/2023, 13:52

GreenVETAfrica Project Questionnaire. (For Policy makers)

GreenVETAfrica Project Questionnaire. (For Policy makers)

The Lagos Waste Management Authority (LAWMA) is conducting research in the framework of the GreenVETAfrica project, an Erasmus+ project funded by the European Commission. The Green Waste Management and Micro Entrepreneurship Vocational Education Training (GreenVETAfrica) project aims to determine the available skills and the industrial needs in the Waste Management sector in Nigeria (with a focus on Lagos State) and Ghana (with a focus on Accra and Kumasi). The outcome of this research will facilitate the development of a curriculum for vocational educational training programs (VET) for unemployed youth in both countries to foster their employability. The curricula will focus on deficiencies, demands and on improving the competitiveness of the micro, small and medium businesses in the waste management sector. Data and responses solely for research purposes and to produce anonymous, statistical research findings and insights. LAWMA will treat the data in accordance with the Nigerian Data Protection Regulation, 2019, the Ghana Data Protection Act, 2012 (Act 843), and the European Union General Data Protection Regulation (GDPR). I confirm that I have read, understood and accepted the points above and am happy to proceed with the research survey on this basis.

Do you understand and wish to proceed?

Yes

Tell us your name

Tell us your gender

Male

Female

Prefer not to say

Which country do you reside?

How long have you worked as a policy maker?

Tell us how many years you have been in the waste management sector

Below 1 year

1 -5 years

6 - 10 years

10 years and Above

What is your level of education?

Primary

Secondary

HND

BSC

MSC

PHD

Do you have any technical or vocational education in waste management?

Yes

No

<https://ec.kobotoolbox.org/v/Oqr1Skze>

13



3005/2023, 13:52

GreenVETAfrica Project Questionnaire. (For Policy makers)

Do you work in the waste management sector?

- Yes
- No

What sector of the waste management business do you operate in?

Are there enough skills to successfully drive your industry?

- Yes
- No

If No, highlight other skills you think are required?

Do you work in a private or public organization?

- Public Organization
- Private Organization

Do you know about or regulate any waste management vocational centre(s)?

- Yes
- No

If yes, please mention them.

Are there vocational centers within your locality?

- Yes
- No

If Yes, do they offer courses that are related to waste management?

- Yes
- No

If no, is there a plan to establish a waste vocational centre?

- Yes
- No
- I don't know

Do you train the sector(s) being regulated by you?

- Yes
- No

If Yes, how Often do you train them?

If No, why?

<https://ee.kobotoolbox.org/x/Oqe1Skae>

2/3

30/05/2023, 13:52

GreenVETAfrica Project Questionnaire. (For Policy makers)

Is there a plan to strengthen capacities of stakeholders in the waste management sector?

- Yes
- No

If Yes, Please mention the plans

Are there policies that guide your regulations?

- Yes
- No

How often do you review the policies to meet up with current trends?

- As need arises
- Rarely
- Sometimes
- Often

Do stakeholders in the industry have access to financial support?

- Yes
- No
- I don't know

Kindly, state the challenges encountered in the waste sector?

Kindly state any other information or comments to improve the skill gap in the waste management industry.

Thank you for your time for completing our survey. Your opinions matter to us a lot and will help us develop the GreenVETAfrica vocational training programme in Nigeria and. If you would like to learn more about us and how we're developing the next phases of our project, visit <https://greenvetafrica.eu/> and follow us on social media.

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