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**Sustainable Strategies and Policy for Plastic Waste Collection and
Management in Germany and Canada
– Lessons for Lagos State, Nigeria**

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Sustainable Strategies and Policy for Plastic waste Collection and Management

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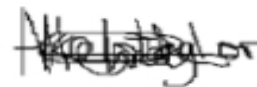
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DECLARATION

I certify that conceptualization and execution of this research titled sustainable strategies and policy for plastic waste collection and management in Germany and Canada - Lessons for Lagos State, Nigeria, was carried out by me under the supervision of Prof. Dr. Hans-Rudolf Bork and Dr. Christina Seidel. In addition, I affirm that no part of this thesis has been submitted in fulfillment of the award of Doctoral degree at any university, neither was it published nor submitted for publication. Furthermore, I wish to state that I adhered to the Rules of Good Scientific Practice of the German Research Foundation while embarking on this research and preparing this thesis. I so state that none of my previous academic degrees has been withdrawn at any time.

KEIL, 15.12.2020

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DEDICATION

This work is dedicated to everyone that has contributed directly or indirectly to my success in life.

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ABBREVIATIONS

No.	Abbreviation	Description
1	SK	Saskatchewan
2	AB	Alberta
3	BC	British Columbia
4	EPR	Extended producers' responsibility
5	SDGs	Sustainable development goals
6	NAFTA	North American free trade Agreement
7	ABS	Acrylonitrile Butadiene Styrene
8	PE	Polyethylene
9	PP	Polypropylenes
10	PVC	Polyvinyl Chloride
11	LCP	Liquid Crystal Polymers
12	PPS	Polyphenylene Sulphide
13	PS	Polystyrenes
14	PET	Polyethylene terephthalate
15	PP	Polypropylene
16	DPSIR	Driver-Pressure-State-Impact-Response
17	EEC	European Economic Community
18	EPA	Environmental Protection Agency
19	3Rs	Reduction, reuse and recycling
20	LAWMA	Lagos State Waste Management Authority
21	PPP	Public-Private Partnerships
22	PSPs	Private Sector Participants
23	CSR	Corporate Social Responsibility
24	LASEPA	Lagos State Environmental Protection Agency
25	EPR	Extended Producer Responsibility

26	LGA	Local Government Areas
27	LCDA	Local Council Development Areas
28	PHCN	Power Holding Company of Nigeria
29	CLI	Cleaner Lagos Initiative
30	LASEPA	Lagos State Environmental Protection Agency
31	PRO	Producer Responsibility Organization
32	DSD	Dual System Deutschland
33	CCME	Canadian Council of Ministers of the Environment
34	CAP	Canada-wide Action Plan
35	AEP	Alberta Environment and Parks
36	DAO's	Delegated Administrative Organizations
37	ABCRC	Alberta Beverage Container Recycling Corporation
38	BCMB	Beverage Container Management Board
39	WMABC	Waste Management Association of BC
40	PPP	Packaging and Paper Products

KURZFASSUNG

Plastikmüll ist in vielen Entwicklungsländern ein großes Problem, das auch vor dem Hintergrund des Bevölkerungswachstums dringend gelöst werden muss. Kunststoffe werden oftmals aus Polyethylenterephthalat (PET) und Polyethylen niedriger Dichte (LDPE) hergestellt. Mit ihnen sind vielfältige Umweltbelastungen verbunden, so auch im nigerianischen Bundesstaat Lagos. Da die Menge an Plastikmüll beständig zunimmt, ist die existierende Infrastruktur für ein nachhaltiges Plastikrecycling unzureichend. In dieser Studie wird Lagos aufgrund seiner wachsenden Bevölkerung, Urbanisierung und Industrialisierung, die mit großen Herausforderungen verbunden sind, als Fallstudie herangezogen. Die Studie untersucht des Weiteren Deutschland und einige ausgewählte Provinzen in Kanada, um europäische und nordamerikanische Perspektiven für Systeme zur Entsorgung von Kunststoffabfällen im Rahmen von EPR-Systemen aufzuzeigen. Die Studie diskutiert auch, wie die beiden Kategorien der EPR-Systeme in Deutschland und Kanada angewendet werden. Darüber hinaus wird auf der Grundlage von Literaturrecherchen die Umsetzung des strengen Verbots und der Durchsetzung von Plastiktüten in Ruanda und die Regulierung von Plastiktüten durch eine Abgabe in Irland erläutert. Der empirische Teil dieser Forschung umfasst eine qualitative Datenanalyse, die auf primären und sekundären Quellen von Feldbeobachtungen beruht. Interviews wurden mit politischen Entscheidungsträgern und anderen beteiligten Interessengruppen geführt. Wichtige Parameter werden identifiziert. EPR-Strategien und die damit verbundenen Komponenten, die im Bundesstaat Lagos übernommen werden könnten, werden vorgeschlagen. Die Forschungsergebnisse können dazu beitragen, eine hohe Rate an Rückgewinnung, Wiederverwendung und Recycling von Kunststoffen zu erreichen, und auch die Wiederverwendungs- und Recyclingwirtschaft der Kunststoffproduktion im Bundesstaat Lagos zu fördern, um schließlich eine Kreislaufwirtschaft erreichen zu können.

ABSTRACT

Plastic waste is a major problem in many developing countries, which needs urgent attention as the population increases. Plastic is constructed from high-density polyethylene terephthalate (PET) and low-density polyethylene (LDPE). Hence, those types of plastics are associated with the environmental problem of plastic pollution, particularly in Lagos State, Nigeria. Furthermore, as the volume of plastic waste continues to increase in Lagos State, the existing infrastructure for sustainable plastic recycling is inadequate. In this research, Lagos is taken as a case study because of its increasing population, urbanization, and industrialization. They are connected with confounding urban challenges. The research further investigates Germany and some selected provinces in Canada to give European and North American perspectives of plastic waste management systems in the context of EPR schemes. The research also discusses how the two categories of the EPR schemes were applied in Germany and Canada. In addition, the research explains the implementation of the strict ban and enforcement on plastic bags in Rwanda and the regulation of plastic bags through a levy in Ireland. The empirical part of this research follows qualitative data analyses obtained through field observation. Questionnaires are used to gather oral interviews from policymakers and other stakeholders involved. The research identifies significant parameters. It proposes EPR strategies and its associated components needed to be adopted in Lagos state, with the Nigerian knowledge. The research results may help target a high rate of plastic recovery, reuse, recycling. They may also promote the reuse and recycling economy of plastics production in Lagos State, which is a pathway in achieving a circular economy.

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CHAPTER ONE

This dissertation aims to understand the possibility of introducing environmental policies needed for the management of plastic waste (bottles, bags and waster sachets) in Lagos State, Nigeria. Investigations were carried out in Germany and some selected Canadian provinces like Saskatchewan (SK), Alberta (AB) and British Columbia (BC) to explain the perspectives of their plastic waste management systems. The research also discusses from literature reviews journals the implementation of ban and levies on plastic bags in Rwanda and Ireland respectively. Furthermore, the first section of this chapter explains the background and statement of the problems in Nigeria's context. This is followed by the aims and objectives of this study, research questions, the significance of the study, and an overview of the whole research structure. Finally, this research is to be adopted in Lagos state, with the incorporation of Nigerian knowledge.

1.1 Nigeria in Contextual Appraisal

Lagos state is chosen as the key study area, because of its increasing plastics pollution menace as a result of population growth, urbanization, industrialization, and unsustainable waste management, which is suitable for this research.

1.2 Background of Environmental Problems

Nigeria is the most populous country in Africa, (Aiyedogbon, 2012). It is situated on the Gulf of Guinea in West Africa, sharing boundaries with Benin, Cameroon, Chad, and Niger. Nigeria consists of 36 states (see Fig. 1 below) with different climates and seasonal conditions. Its population has been projected to be 205 million people in the year 2020 and will continue to increase (www.statista.com, 2017). The majority of the population has chosen to migrate to urban cities and the trend is rising (UN, Habitat 2011) (see Fig. 2 and Table. 1 below) in search of better living conditions.



Figure 1: Map of Nigeria Showing Lagos state

Source: Researcher input modification

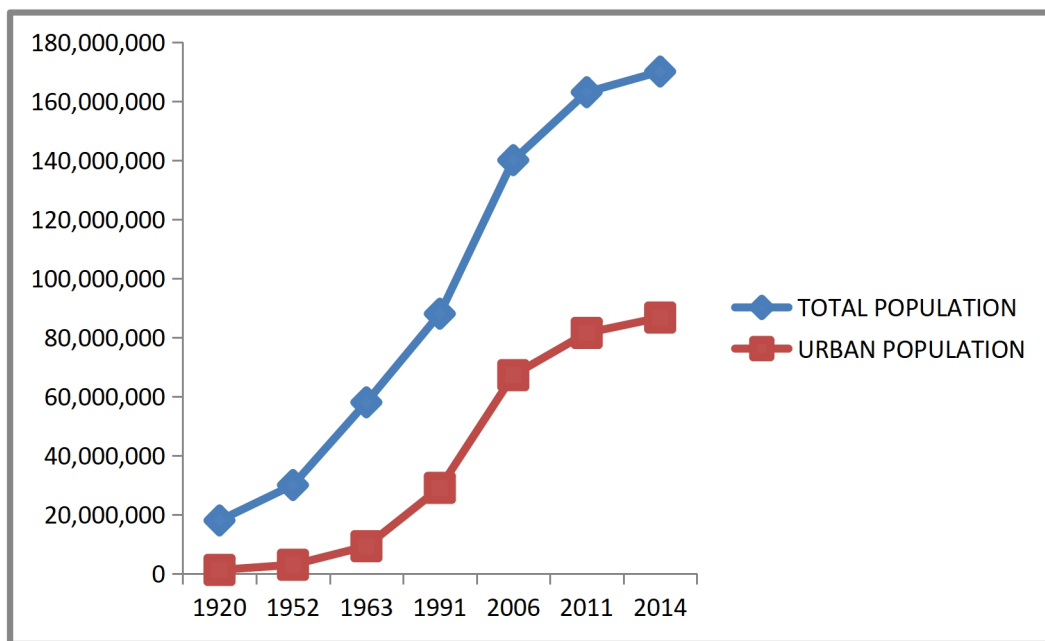


Figure. 2: Trend of Population Growth in Nigeria

Source: Dung-Gwom (2015)

Table 1: The Trend of Urban Population Growth in Nigeria

Year	Total Population	Urban Population	Percentages of Urban Population
1920*	18,000,000	1,260,000	7%
1952*	30,000,000	3,000,000	10%
1963*	58,000,000	9,280,000	20%
1991**	88,000,000	29,040,000	35%
2006**	140,000,000	67,200,000	47%
2011***	163,000,000	81,500,000	50%
2014***	170,000,000	86,700,000	51.5%

Source: Dung-Gwom (2015)

Figure 2 and Table 1 show that over 51.5% (86.7 million) of Nigerians live in urban areas in 2014 (Dung-Gwom, 2015). Urban city populations in Nigeria have produced some negative and positive impacts as Nigeria's economy becomes the largest economy in Africa (www.dbresearch.de, 2014). For example, it has been presumed that many investors have gone into plastic manufacturing and packaging activities such as plastic bottles for water, water sachets (known as sachets pure water), and plastic bags known as nylons. Simultaneously, this has provided employment opportunities and livelihood for many Lagos state residents. On the other hand, the negative impact contributes more to environmental degradation, which implies the 'abuse of the environment resulting in the present state of plastic pollution. Additionally, It was observed during the research field survey that plastic waste litters the streets, clogs drainage systems, and pollutes waterways (see chapter 13). This occurrence is a result of an absence of environmental awareness and failure to implement environmental policies in tackling those problems. Hence, this research will propose some sustainable strategies to manage plastic waste without polluting the environment.

1.2.1 Statement of the Problems within the Context of Plastic Bottles, Bags, and Water Sachets

Plastic is a material in high demand and its waste is expected to increase as new products are developed to meet human demands. Plastic waste is a major problem in many developing countries that needs urgent attention. Plastic in the context of bottles, bags, and water sachets is constructed from high-density polyethylene terephthalate (PET) and low-density polyethylene (LDPE). Hence, those kinds of plastics are associated with the environmental problem of plastic pollution in Lagos state (see chapter 4 of section 4.2). Also, the use of plastic for packaging drinking water generates more waste and is eventually a result of poor water management apparently reflecting the lack of urban water supply for all Lagos residents. This occurs mainly during the dominant dry season which allows more intake of water. Hence, after consumers purchase the plastic packaging drinking water from vendors, most consumers eventually discard the empty plastic waste indiscriminately on the streets, resulting in pollution. Likewise, the selling of food as take-away home in plastic packaging items from fast-food restaurants and canteens aggregate to pollution. Also, the free giveaway of single-use plastic bags (nylon) after shopping from various stores and shopping centers in the city also intensifies the problems of plastic pollution in Lagos State. For instance, it was recorded that out of the 10,000 plus metric tonnes of waste generated per day in Lagos, 12 percent low density consists of plastic materials in the form of soft drink and water in plastic bottles and sachet drinking water. This also includes other consumable goods packaged with plastics (www.thewillnigeria.com). Therefore, the research will also analyze the management of plastic waste within the context of Extended Producer Responsibility (EPR), product stewardship (PS), tax, levy, and ban as strategies to manage plastic waste.

1.3 The Research Work

The idea of this research work came into reality, after accessing various waste management problems in Nigeria leading to environmental degradation. For this reason, I decided to identify appropriate environmental policies that will be suitable for plastic waste management in Lagos State. This research will adopt the three main types of descriptive research methods, which are case-study, observation, and surveying methods. Finally, the contribution of the findings will help to understand different strategies that are needed to address plastic waste management in Nigeria.

1.3.1 Content of the Research

The study took place in Lagos State Nigeria, Canada and Germany as social research. Data collection will involve qualitative approaches through primary and secondary sources with a comparative recommendation outcome.

1.3.2 Aim and Objectives of the Research

The aim of the research is to achieve sustainable plastic waste management with the following objectives:

1. To investigate the current state of plastic problems in Lagos State.
2. To design sustainable strategies for plastic waste management collection, recovery, and recycling in Lagos state.

1.3.3 Research Questions

1. What is the present state of plastic pollution in Nigeria?
2. What are the environmental impacts of plastic pollution in Lagos State?
3. What are the recommended environmental policies needed to combat plastic pollution in Lagos State?

1.3.4 Significance of this Research

The successful completion of this research will recommend some functional policies that will better improve plastic waste management in Nigeria. The research will also provide in-depth scientific information for policymakers, environmental activists, researchers on various ways to improve the Nigerian waste management system

1.4 Limitations of the Study

The research is limited to Lagos state and only covers the problems and challenges of plastic waste management. The study may not reflect all the existing situations in other states of Nigeria, but by and large, there is a strong belief that the recommendation of this research can be adopted by other states.

1.5 Overview of the Thesis Structure

This thesis consists of the following chapters:

Chapter 2 gives a review of the literature on the history of plastics and its classification in a global context. The chapter also describes plastic productions, types, properties, and uses.

Chapter 3 briefly reviews the economy of plastics production from linear, reuse/recycling to the projected circular economy model. The chapter also explains the transition process models of plastics production.

Chapter 4 briefly reviews the economy of plastics production in Nigeria. The chapter also explains the sources and effects of the linear economy in Lagos state. This chapter contributes to the outcome of the proposed strategies in this research.

Chapter 5 briefly gives an overview of waste management and waste hierarchy guidelines. This chapter has also helped in identifying how plastic waste should be managed in Lagos state.

Chapter 6 gives an overview of the structure and the practices of the waste management system in Nigeria and Lagos state.

Chapter 7 reviews the concept of corporate social responsibility, its components, and the activities of plastics and packaging industries in Lagos state. The chapter also presumably correlates the concept of corporate social responsibility and sustainable development in addressing plastics waste management.

Chapter 8 reviews the concept of Extended Producer Responsibility (EPR) and its application to plastic waste. The researcher also discusses the collection systems for

plastic waste as well as the use of a ban and a levy as an option to minimize the increasing plastic bag pollution in Lagos State.

Chapter 9 describes the profile of the study and investigated areas in order to glean more information. The variables analyzed includes physical and socio-economic environment such as location and size, demographic characteristics, climate and weather, ethnicity and religion, etc. The chapter also briefly discusses the profile of the investigated areas like Germany, some provinces in Canada, Rwanda, and Ireland.

Chapter 10 describes the research methodology and framework. This research adopted the three types of descriptive research methods, which are case study, observation, and surveying method to analyze various environmental policies used in Canada and Germany.

Chapter 11 presents the interpretations from questionnaires as they were gathered through oral interviews and the application of questionnaires as administered to the policymakers and other stakeholders involved in this social research.

Chapter 12 discusses the investigations that were carried out in Germany and Canada. These countries were chosen to give some European and North American perspectives of plastic waste management systems in the context of EPR schemes. The chapter also discusses how the two categories of the EPR schemes were applied in Germany and Canada. Also, the selected Canadian provinces have different Stewardship schemes and full EPR policy. Also, the chapter explains from literature reviews the implementation of the strict ban and enforcement on plastic bags in Rwanda and the regulation of plastic bags through a levy in Ireland. Thus, part of the outcome of this chapter was used in formulating the proposed strategies.

Chapter 13 discusses the findings according to the researcher's field observation and survey. Also, the researcher was able to interpret the problems of plastics pollution in Lagos state according to the waste hierarchy guideline.

Chapter 14: The researcher can identify some significant parameters necessary for sustainable plastic waste management in Lagos state.

Chapter 15 proposes EPR and levy as strategies policy instruments that will help to minimize the increasing amount of plastic waste in Lagos State. Also, the two proposed EPR strategies and their components can only be effective with the set of supporting parameters. More so, the two EPR strategies adopts "deposit fee" in order to target high collection and recycling rates of plastic (drinking) bottles and sachets water waste. Likewise, levy was proposed to minimize the uses of plastic bags. On the other hand, EPR and levy are proposed to tackle plastic waste in the context of plastic bottles, bags, and sachets water waste in Lagos State.

Chapter 16 concludes the whole research work.

CHAPTER TWO: BRIEF REVIEW ON PLASTICS AND ITS CLASSIFICATION

2.0 Introduction

Chapter two gives a review of the literature on the history of plastics and its classification in a global context. The chapter also describes plastic productions, types, properties, and uses.

2.1 Plastics and Its Classification

The term plastic originates from “pliable and easily shaped”. Plastics are categorized as polymers. Over the last decades, plastics have become versatile useful materials in various applications. Also, the various forms of plastic types are developed for different uses in the industries. The history of plastics begins when Alexander Parkes successfully invents the first thermoplastic in the mid 19th century. This invention received an award at the World International Exhibition in London and was patented under the trademark name called “Parkesine” but Alexander Parkes was not able to certify the stability and the quality of his discovery. Subsequently, John Wesley Hyatt in the year 1869 was tracing the stability to the “Parkesine” invention when he made a sudden discovery of a material substance called celluloid used in the manufacturing of collars and cuffs (Friedel, 1983). Thus, another discovery in the 1890’s that revolutionized the plastic and packaging industries was made by Leo Hendrik Baekeland a chemist, as he discovers some substances called phenol and formaldehyde with an outcome resulting in the invention of synthetic resin (Haynes, 1961, Baekeland, 1909, Gillis, 1965). Consequently, Leo Hendrik Baekeland in 1907 proved the theory of his invention and it was patented under the trademark name called “Bakelite”. More so, in the years 1909/10, Leo Hendrik Baekeland introduced his discovery to the New York club of chemists and later formed a company named Bakelite Gesellschaft GmbH in Germany to develop plastic materials for various uses in the business market. These discoveries in the 19th century formed the history of the plastic and packaging industries' business market to date. Also, the beginning of the 20th century marks the inventions of many plastics commonly used today. Hence, the invention of Baekeland’s company has formed the basis of all other plastics production companies around the world.

2.2 Plastics Production on a Global Scale

Today, plastics production has grown into multi-billion-dollar industries with various types of plastic for specific uses. This significant increase in plastics production is correlated to different applications as it is used in making bags, toys, cars, clothes, smartphones, and packaging items. The demands in various uses of plastics have resulted in increasing plastics production on a global scale. According to Geyrer et al. (2017), the total plastics production on a global scale reached 322 million tonnes in 2015 (see Fig. 3 below).

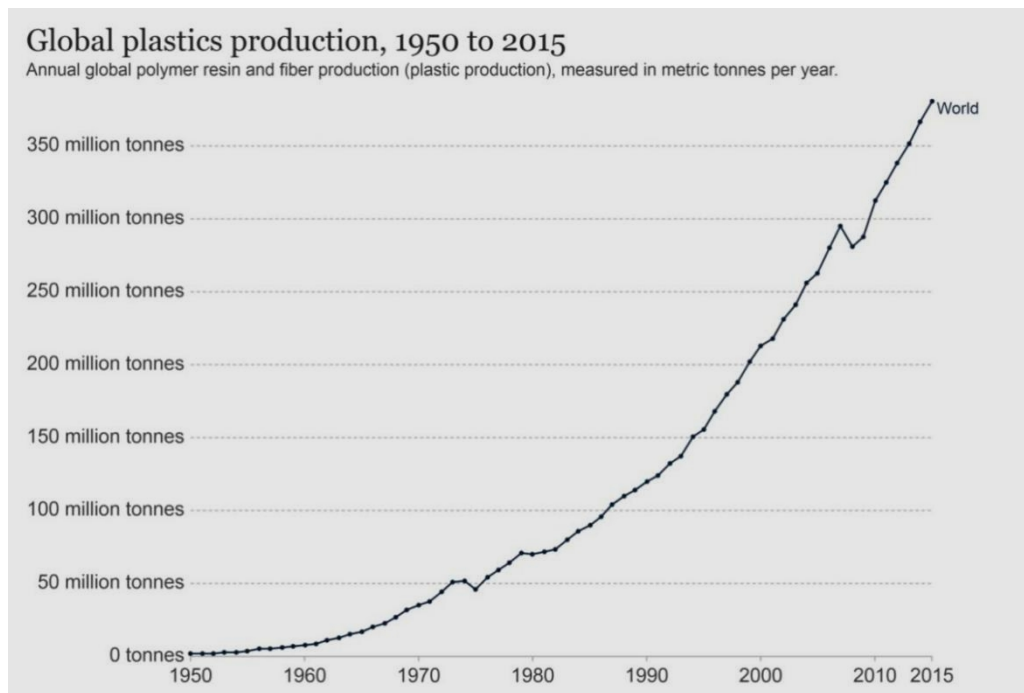


Figure 3: Global Production Volume of Plastics from 1950–2015 (in million tonnes)

Source: Geyrer et al. (2017)

Fig. 3 indicates that the increasing plastics production has reflected its exponential growth on a global scale over decades. Furthermore, the increasing plastics production has been presumed to grow over the next decades, if a substitute for plastic is not derived. According to a comprehensive report from STAP (2018), Europe produces 18% of all plastic, while 19% were produced by the countries of the North American free-trade agreement (NAFTA), which comprises the United States, Canada, and Mexico. China is taking the lead on global plastics production with 28%, while the other Asian countries share 21% of the global plastics production as reported in 2015 (STAP, 2018; cf. fig. 4).

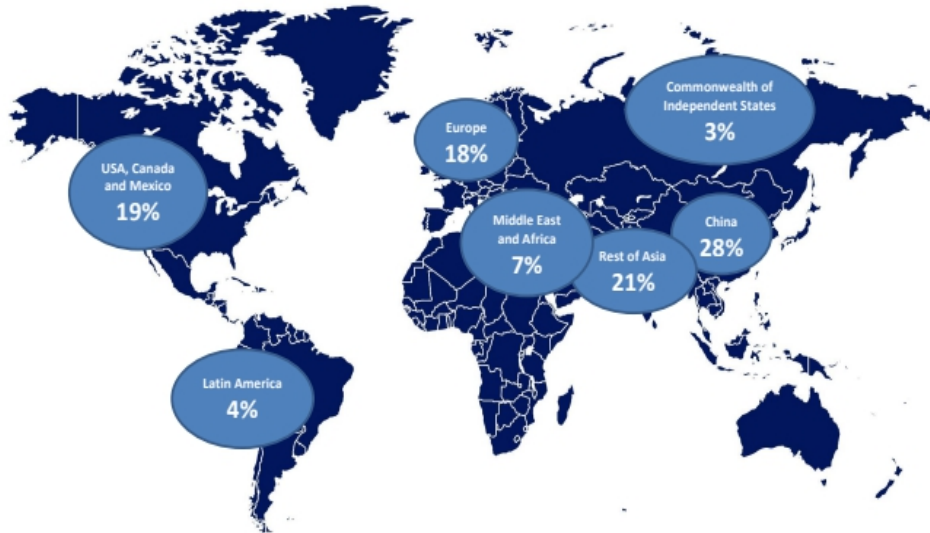


Figure 4: Global Distribution of Plastics Production

Source: STAP (2018)

Since the production of plastics increases on a global scale, there is a strong need to implement universal policies to manage the accumulated plastic waste. As documented by STAP (2018) and Geyer et al. (2017), only 9% out of the 6300 Mt of plastic waste generated from 1950 until 2015 were recycled globally. In addition, among the primary form of plastics production sectors globally, plastics for packaging purposes are leading with 146 million tonnes of production in 2015 as seen in figure 5.

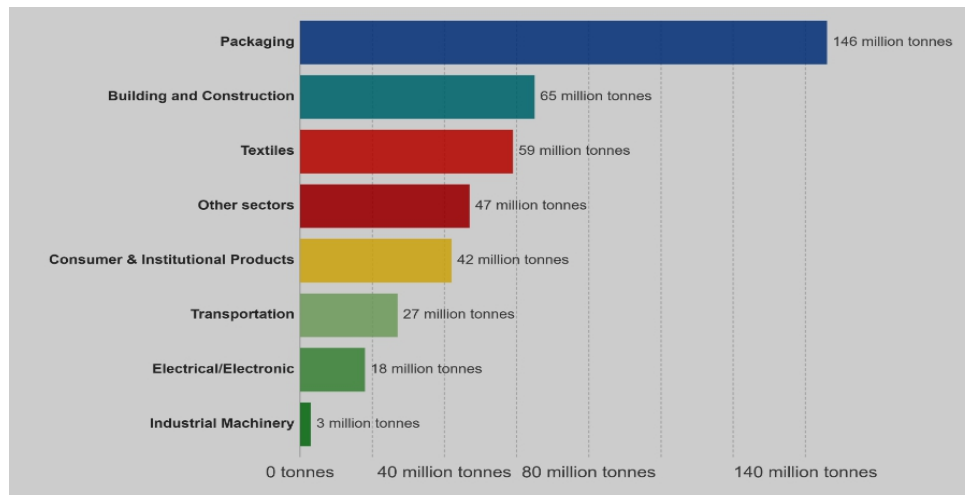


Figure 5: Primary forms of Plastics Production by Industrial Sectors in 2015

Source: Geyrer et al. (2017)

This pinpoints the underlying challenges of plastic pollution in a global context. Nonetheless, some developed countries were able to enact the implementation of environmental policies to collect and recycle plastic waste respectively. For example, it

was reported by IEEP (2018) that Germany had already collected and recycled 93.5% of its PET bottle waste in the year 2015, while Norway collected more than 95% of its PET bottle waste. Furthermore, the ongoing collection and recycling rate of plastic PET bottle waste in countries like Germany and Norway is an indication that the projected circular economy model can be achieved. In these regards, the researcher could suggest a need to legislate environmental policies in Nigeria for the benefit of achieving a meaningful collection and recycling rate of plastic waste. Therefore, this research will identify various pathways in which sustainable plastic waste can be achieved in Lagos State. State.

2.3 Types of Plastics, Properties and Uses

Plastics are polymers that originate from petrochemicals and are classified according to their types, properties, and uses. Plastics are differentiated according to their weight, cost, durability, and strength. Besides, it is important to understand plastic chemical structures and nature as it is widely used in a range of applications. Plastics are classified into two types namely thermoplastics and thermoset plastics in line with their thermal properties as discussed below.

2.3.1 Thermoplastics

Thermoplastics do not undergo chemical changes in their composition during the application of heating and pressure. Thus, thermoplastics can also be easily softened and molded into different forms during the process of applying heat and pressure (Lecture 4.1: Thermoplastics and Thermosets). Hence, there are various techniques available during the molding process of thermoplastics which include mechanical fastening, fusion and solvent bonding, hot gas, ultrasonic, induction and dielectric welding (www.nptel.ac.in). Yet, thermoplastics can be reversed during or after heating without affecting the mechanical properties. Also, thermoplastics molecules have a series of long chains, being joined together from end to end.

Thereby, after melting thermoplastics, crystalline disappears into liquids forming a partial crystalline in molecules (Lecture 4.1). More so, the properties of thermoplastics have some distinguishing features such as hardness, durability, transparency and high resistance of chemicals. Thermoplastics are widely used in various applications such as in phones, cars, electrical products, cables, plastic packaging items, etc. Thermoplastics are also considered non-biodegradable plastics, nonetheless, they are recyclable. Although, it was gathered from a presumption that the increasing rate of thermoplastics

recycling may result in color degradation. However, according to (Lecture 4.1) there are various types of common thermoplastics: Acrylonitrile Butadiene Styrene (ABS), Acetals, Acrylics, Cellulosics, Fluorocarbons, Polyamides, Polycarbonates, Polyethylene (PE), Polypropylenes (PP), Polystyrenes, Polyetheretherketone, Polyvinyl Chloride (PVC), Liquid Crystal Polymers (LCP), Polyphenylene Sulphide (PPS) and Vinyl.

2.3.2 Thermosets

Thermosets are plastics that undergo chemical changes after heating above the melting temperature with high cross-linked structures (Lecture 4.1). They are irreversible and cannot be recycled after undergoing the solidification process known as curing. Hence, the molecules are chemically linked together during the process of curing to form complex inter-connected network structures of the polymer. Thermosets are usually in three-dimensional network structures, cross-linked between polymer chains by restricting the motion of chains leading to a rigid material in molecular structure. Thermosets, undergo various processes at different stages which involves the use of ultrasonic and laser welding, and adhesive bonding in case of lowering the strength applications.

However, the transformation of the thermosets from the liquid to the solid state is irreversible and results in chemical decomposition during reheating. Thermosets are softening during high-temperature heating but will be permanently hardened afterward without reshaping into other forms. They are classified according to their design, tensile, comprehensive strength and hardness (www.nptel.ac.in). Besides, thermosets are not temperature-dependent but are generally stronger in various applications as seen in electrical appliances, kitchen utensils, circuit boards, and circuit breakers, etc. Hence, it is necessary to understand the various types of plastics, their properties, and their uses to encourage sustainable management of their end products as waste.

CHAPTER THREE: BRIEF REVIEW ON ECONOMY OF PLASTICS PRODUCTION

3.0 Introduction

Chapter three briefly reviews the economy of plastics production from linear, reuse /recycling to the projected circular economy model. The chapter also explains the transition process models of plastics production. This chapter further contributes to this research outcome.

3.1 Linear Economy Model of Plastics Production

According to the briefing of the European parliament (2014) the linear economy model is considered to be a 'take-make-consume-throw away' pattern. This means that the long-lasting linear economy model of plastics production has led to serious environmental pollution and extensive use of limited natural resources. Similarly, the linear economy model of plastics production has literally turned useful raw materials into waste without recognizing the potential economic benefits. This implies that very few plastics used in various applications are collected for recycling. Therefore, the researcher can assume that various plastic end-products are discarded into the environment in different forms. Hence, the end-products of plastics as waste could have eventually become a useful raw material if proper management systems were adopted. However, it is necessary for the researcher to highlight these current and future environmental problems of plastics production in a linear economy model as seen in figure 6.

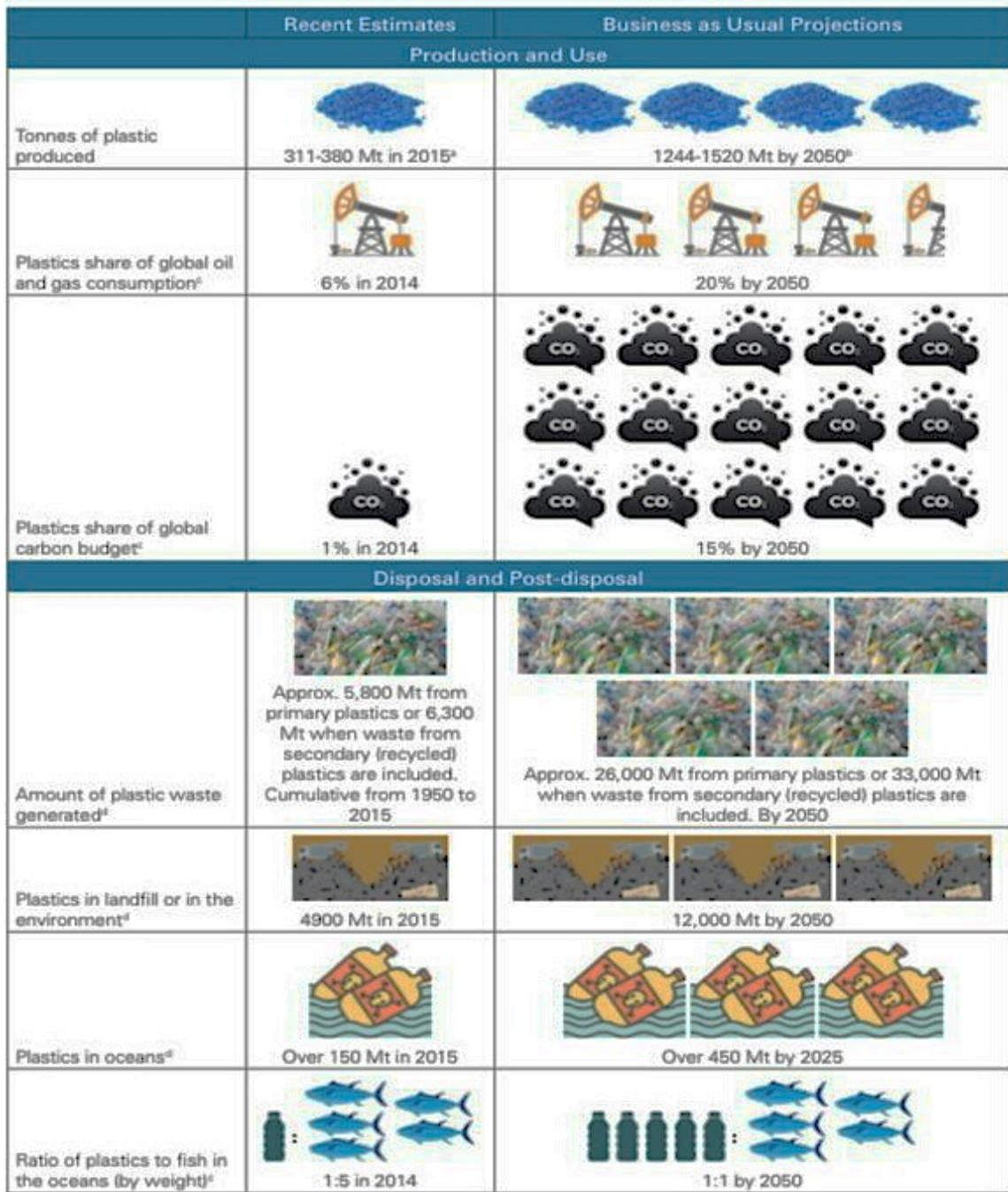


Figure 6: Current and Future Environmental Problems of Plastics Production

Source: STAP (2018)

Although, there has been a global paradigm shift to the attention of the stakeholders with regards to the growing environmental problems of plastics waste in a linear economy model (SPI, 2019). Thence, this has yielded some positive responses by bringing all stakeholders to a round-table discussion to analyze the current and future environmental impacts of plastics production with profound solutions. In these regards, many developed countries like Germany and Canada have explored the opportunities by moving away from the linear economy of plastics production to a reuse/recycling economy. On the

other hand, country like Nigeria, still have a long way to go in dealing with the current linear economy of plastics production. Latterly, there is a need to adopt strict policies, strategies and parameters to regulate the pattern flows of plastic materials without generating waste in Nigeria.

3.2 Reuse /Recycling Economy Model of Plastics Production

According to Shaos (2009), the reuse/recycling economy model is considered to be the kind of economy that enables clean plastics production and the comprehensive utilization of plastic end-products as useful raw materials. This reuse/recycling economy model supports the concept of the waste hierarchy guideline. Hence, the waste hierarchy guideline ranks waste management options according to environmental benefits (see chapter 5). Therefore, the researcher presumed that the reuse/recycling economy model was a concept adopted from the waste hierarchy guideline to minimize the increasing plastic waste. Furthermore, countries like Germany and Canada have adopted the reuse/recycling economy model of managing plastic waste with recycling infrastructures, reorganized institutions, and the promotion of environmental education and awareness respectively. Yet, those countries still find it very difficult to reuse and recycle all of their collected plastics end-products materials as waste. This is the reason why significant amounts of plastic waste tones were shipped to various countries as agreed upon. For example, Germany exported 114,000 tons of recyclable plastic materials to Malaysia from January until October 2018, (www.handelsblatt.com), while Canada also exported plastic waste to the Philippines, which was literally sent back due to non-compliance with their initial set of agreements and parameters (<http://theconversation.com>). Thus, the researcher could presumed that this act is a result of limitation in recycling capacity or return economic benefits upon the initial agreement set by both countries. Hence, this is an indication that those countries mentioned above still need to adjust to sustainable plastics management in order to achieve the projected circular economy. On the other hand, it still very difficult to adopt the reuse/recycling economy model of plastics production and management in Nigeria. This has intensified the problems of increasing plastics pollution across all the Nigerian states including Lagos state. Thence, the recommendation of this research will highlight appropriate steps to achieve the reuse/ recycling economy model in Nigeria.

3.3 Circular Economy Model of Plastics Production

According to the report from Ellen MacArthur. Foundation (2013) circular economy model refers to an industrial economy that is restorative by intention; aims to rely on renewable energy; minimizes, tracks, and eradicates waste through careful design”. Athanasios (2018), suggested that the circular economy model is considered to be a concept that integrates sustainable economic activities and environmental balances. Hence, the researcher could presume that a circular economy model will promote the restoration of plastic discarded as waste back to its original state. Furthermore, the circular economy model integrates the concept of sustainable development to maintain balance in environmental chain flows of plastics production (see figure 7).



Figure 7: Plastics Waste in a Circular Economy Model

Source: www.oxygreenplastics.com

Plastics production in the circular economy model will be accomplished through sustainable redesigning for the possibilities of creating further valuable plastic materials for uses. This means that the circular economy model of plastics production will enable the use of sustainable or green chemical components that could easily be reused, recycled, with less consumption of energy or adaptation of alternative sources (Tom, et al 2019). Hence, the circular economy is the future

destination of sustainable plastics production with exclusive zero plastic waste. Therefore, this research will recommend strategies, parameters, and components as a road-map agenda to circular economy model of plastics production in Lagos State.

3.4 Transition Processes Models from Linear, Reuse/Recycling to Circular Economy of Plastics Production

Over the decades, the transition process from linear to ongoing states of reuse/recycling economy and then to the projected future circular economy model have guaranteed high expectations and possibilities. Literally, this means that this ongoing transition process is evident that sustainable plastic production and sound environmental management of plastic waste will be achieved in due time as seen in figure 8.

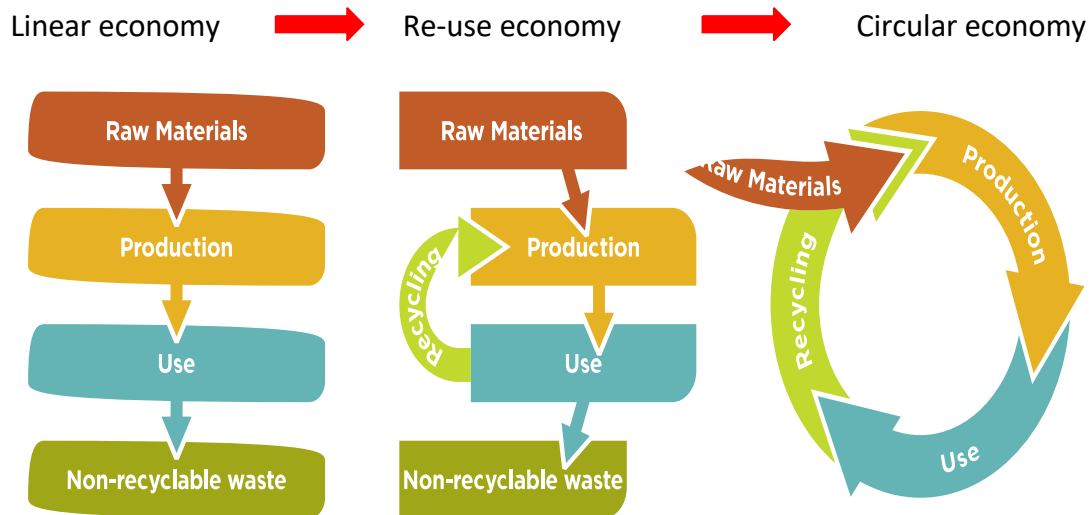


Figure 8: Transition Processes from a Linear, Reuse/Recycling to Circular Economy Model as it has been Projected for Sustainable Plastics Production

Source: www.government.nl

On the other hand, the reuse/recycling economy model has gradually resolved various environmental problems generated from the linear economy model of plastics production in selected investigated countries like Germany and Canada. Moreover, this is a confirmation that the circular economy will be achieved globally as the transition process is still ongoing. Contrariwise, this is an opportunity for a country like Nigeria to move away from the linear economy model of plastics production in the short and long term. Thence, this could be achieved by setting a time-frame baseline with applicable strategies and parameters to achieve the reuse/recycling economy model. Thereby, these

applicable strategies and parameters will foster sustainable plastics production without causing any increasing exponential environmental problems such as waste. This will also require robust environmental technologies through hybrid and triple helix models (policy, research, and investment) with a focus to achieve the reuse/recycling economy model of plastics production in Nigeria. Therefore, this research is necessary to find exponential solutions away from linear to reuse /recycling economy model then, to reach the projected circular economy model in Lagos State.

CHAPTER FOUR: BRIEF ECONOMY OF PLASTICS PRODUCTION IN NIGERIA

4.0 Introduction

Chapter four briefly reviews the economy of plastics production in Nigeria. The chapter also explains the sources and effects of the linear economy in Lagos state. This chapter contributes to the outcome of the proposed strategies in this research.

4.1 Brief History of the Economy of Plastics Production in Nigeria

The economy of plastics production came into existence in the 1960s with about four plastic companies in Nigeria. Before the emergence of plastics in Nigeria, the packaging methods were normally done traditionally through papers, leaves, animal skins, etc. The emerging economy of plastics production in the 1960s has played some vital roles in packaging methods in Nigeria as plastic industries continue to expand, putting Nigeria forward as one of the leading plastics and packaging industries in West Africa. Meanwhile, the expansions in plastic industries in Nigeria can also be related to the existence of petrochemical companies due to oil exploration activities. Similarly, the existence of petrochemical companies has made polymers and plastics very cheap and easily accessible in Nigeria. The economy of plastics production in Nigeria comprises both local and international investors. The majority of the local investors invested in medium and small-scale activities with about 30% of polyethylene terephthalate (PET) and polypropylene PP plastics production. This kind of plastics is used mainly for packaging foods, soft drinks, water, and other beverage goods. Medium and small-scale manufactures also produce plastics like cups, plates, buckets, toys, etc. The majority of international investors mainly from India, China, Lebanon, and Europe have invested in large scales of plastics production activities in Nigeria (<http://www.ppp-nigeria.com>). The economy of plastics production plays a vital role in Nigeria and neighboring West African countries. This is seen as a result of the needs of plastics by neighboring west African countries depends on Nigeria's plastics production capacities. Therefore, this has also put more pressure on the demands for plastic in Nigeria with the intensified advantage of sourcing for raw materials resulting in the importation of plastics in primary form. Most of the plastic raw materials are imported mainly from the middle east, Europe, and Asia into the Nigerian market in primary forms (<http://www.ppp-nigeria.com>).

More so, plastics production will double its increase in Nigeria and other neighboring West African countries as the newly built largest petrochemical refinery in Africa known as Dangote refinery situated in Lagos State will commence its operation in the year 2021. Thus, the positive impacts of this petrochemical refinery commencing operation will develop Nigeria's economy. However, the negative impacts will be attributed to plastics pollution if increasing plastic waste is not controlled. Therefore, this research seeks to provide the appropriate scientific solutions that are needed to tackle the plastic waste problem in Nigeria in order to control further pollution increases.

4.2 Sources and Effect of Linear Economy in Lagos State

The increasing plastics production in Lagos state contributes to economic growth, which is seen as a positive impact. Meanwhile, the increasing plastics production without managing its end-products as waste has literally generated plastics pollution reflecting a negative impact. This negative impact is mitigated by the increasing scale of plastics production, consumption patterns, and unsustainable disposal practices. Thus, this negative impact has caused adverse effects resulting in the linear economy model. This linear economy model of plastic waste in Lagos state will continue as there is an absence of imperative solutions such as substantial infrastructures, increasing institutions, excellence in the policy framework, environmental education and awareness. Moreover, the absence of those imperative solutions as mentioned above has intensified the problem of plastic pollution and the tendency is still on a high increase. This reaffirmed the declaration of plastics waste as a major environmental issue (GESAMP, 2016; Richard, 2017; Werner et al., 2016). Plastics waste in Lagos state is associated with various environmental problems resulting in littering and pollution of the marine environment, etc. The researcher will, therefore, highlight some common types of plastic resulting in pollution as seen in figures 9 and 10.

Polyethylene terephthalate (PET)	Low density Polyethylene (LDPE)
	
<p>Mainly use for packaging of bottled water and other soft drinks</p>	<p>Mainly use for packaging of Sachets pure water</p>
<p>Source: https://businessnewsreport.com.ng/coca-cola-chooses-plastic-bottle-collection-over-aluminium-cans-to-cut-carbon-footprint/</p>	<p>Source: https://www.etvghana.com/price-of-pure-water-to-be-increased-to-gh%2%A20-30p-on-november-12-2018/</p>

Figures 9 and 10: Common Types of Plastic Associated with Environmental Problems in Lagos State

The above figures indicate that polyethylene is the major source of plastic waste in resulting in pollution. Therefore, the researcher can assume that plastic waste derived from polyethylene will double the total number of municipal wastes tonnes in Lagos State. Similarly, the researcher could also predict that tonnes of plastic waste derived from polyethylene will increase significantly on major landfill sites in Lagos State. Thence, this could be related to the current situation observed by the researcher during the field study and survey (see chapter 13). Despite all, the researcher will represent the current situation of plastics pollution in the Lagos state using the Driver-Pressure-State-Impact-Response (DPSIR) framework as shown in figure 11.

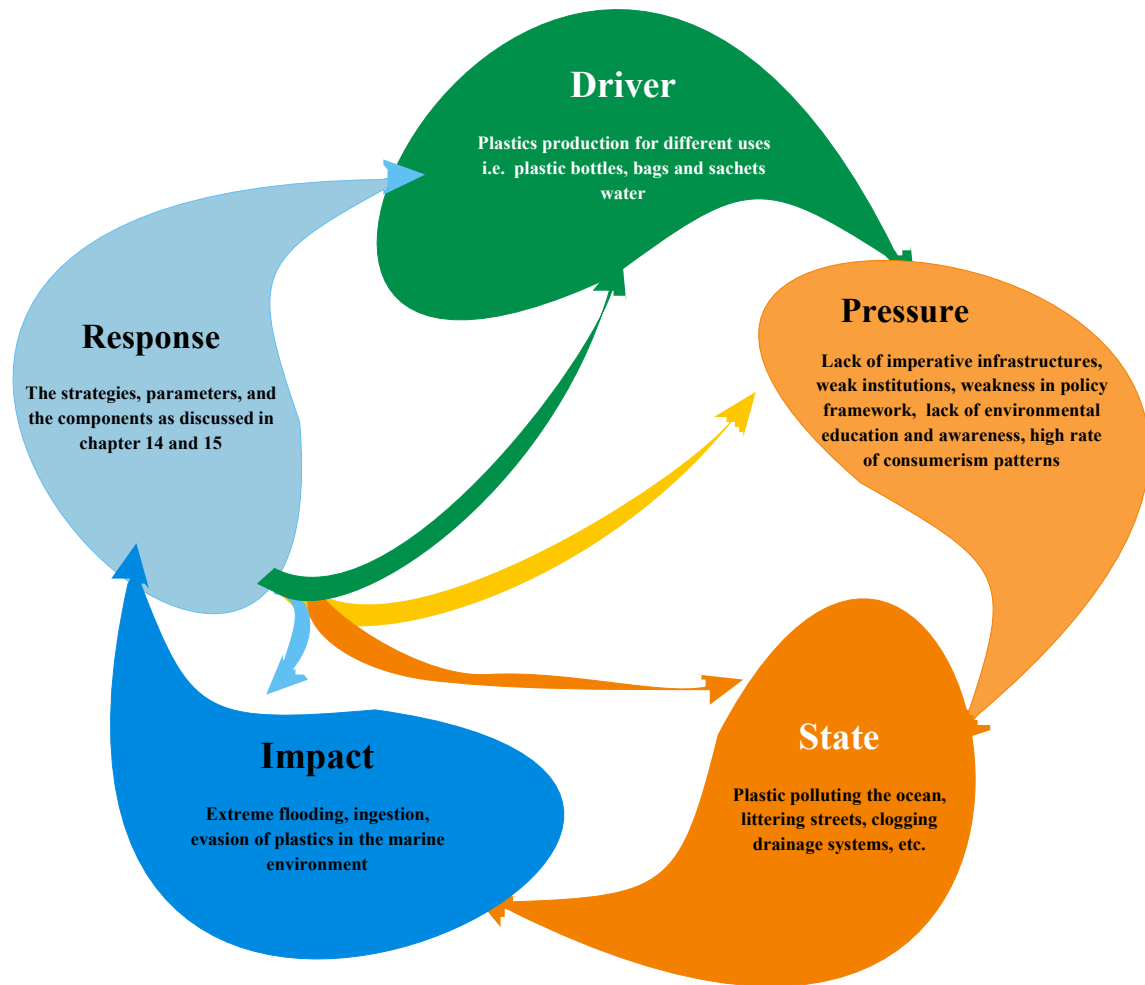


Figure 11: Present State of Plastics Pollution Using (DPSIR) Framework Representation.

Source: Researcher input

As illustrated in figure 11, the driving forces represent the demands for packaging items in the context of plastic bottles, bags, and sachets water. Also, the driving forces could be related to the statement of the problems as discussed in section 1.2.2. These associated plastic end-products as waste generated from human wants result in pressure in the environment due to consumerism patterns, lack of imperative infrastructures, weak institutions, weakness in the policy framework, lack of environmental education and awareness as well as unsustainable waste management system in Lagos state. The pressure could be correlated to the parameters as discussed in chapter 14. The situation degenerated to the current state of environmental problems of plastics polluting the ocean, littering streets, clogging drainage systems, etc. And the impact has emanated to evasion of plastics in marine environments and ingestion of plastics by aquatic animals etc. Therefore, the current state and impact could be attributed to the Interpretation from the field observation and survey as discussed in chapter 13. However,

the response is still insufficient, which has led to the exponential increasing environmental problems of plastics waste in Lagos State. Thus, the researcher proposes some strategies, parameters, and components as discussed in chapters 14 and 15 as imperative solutions to the present linear economy of plastics production in Lagos State.

CHAPTER FIVE: BRIEF OVERVIEW ON WASTE MANAGEMENT SYSTEM

5.0 Introduction

Chapter five briefly gives an overview of waste management and waste hierarchy guidelines. This chapter has also helped in identifying how plastic waste should be managed in Lagos state.

5.1 Understanding Waste Issues

It is known that half of the world's population are moving to dwell in urban centers in different countries because of rapid industrial globalization and modernization in those cities (Tacoli, 2012; UNPD, 2012a) (see figure 12).

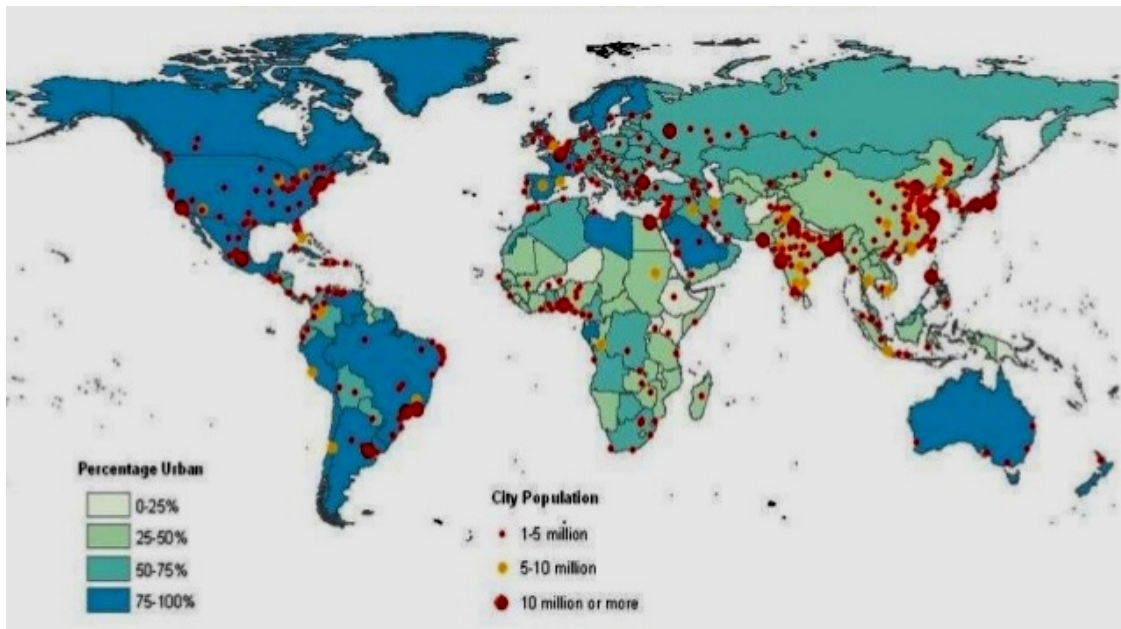


Figure 12: Increasing urbanization in cities population

Source: UNEP (2013)

This supports the report by UNPD (2012a) that 64 percent of the population in developing countries and 86 percent of the population in developed countries will move to reside in urban cities by the year 2050. Then, it could be assumed that more waste will be generated in urban cities due to the correlation between human migration and waste. Moreover, waste is now becoming a global issue as societies generate fractions of waste through goods- and service-based economies with high productivity and consumption patterns. The rate of industrialization, mass consumption patterns, and improper waste

disposal behavior have contributed directly to the increasing volume of waste generation, posing serious health and public hazards. .

Similarly, the researcher could suggest that the danger of waste to human health and public hygiene must be treated as a global issue considering the increasing rate of populations. Meanwhile, waste crisis has resulted from these six following factors: globalization, industrialization, urbanization, modernization, mass consumption patterns, and waste disposal habit of the populations. It can be assured that these six factors have significant impacts either in waste reduction or increase per day in every city. Tacoli (2012) suggested that privatization of waste management systems under government control has helped to handle the high volume of increasing waste per day in the cities. On the other hand, the absence of sufficient capacity to handle the high volume of waste in Nigeria has resulted in environmental degradation. This supports the finding of the World Bank (2012) and UN-HABITAT (2010) that preferences should be given to adequate waste management budgets in many urban cities especially in developing countries. Therefore, this research will help to develop the needed attitude and mindset about waste as a valuable resource to build wealth.

5.2 Developments of Waste and Waste Management

Waste is very significant in our societies of today and it is everyone's business. We all produce wastes in nearly everything we do. One of the earliest famous waste incidents that occurred was in London around the 1880's. The 'the Great Stink' occurred due to improper sewage systems, illegal waste dumping, and little regard for public hygiene. During this time, waste was dumped openly in the Thames River due to the absence of waste treatment and management systems. Furthermore, this situation degenerated to a poor hygienic condition, which led to cholera outbreaks killing many people in London (Stephen, 1999). At that time, the situation awakened environmental consciousness in many countries. Thereafter, different countries engaged all stakeholders to be responsible for public sanitation and hygiene, through proper treatment and management of waste. Thus, these responsibilities spread across many countries including cities in the USA, and led to the conduct of adequate collection and disposal habits of waste (Strasser, 1999). Consequently, different waste management challenges that occurred in the past have been categorized under inadequate role performances such as lack of collection systems and funds, shortages of waste transport vehicles, improper role definition, lack of functional infrastructural capacity and institutions, etc. The use of contemporary

technology at the latter end of the 19th century to manage waste improved the environmental situation to some certain point. This supports the report by Awomeso et al (2010) that watertight garbage cans and sturdier vehicles were first introduced in developed countries to collect and transport waste in a more environmentally friendly manner. Thus, these technological advances continued during the first half of the 20th century, through the use of garbage grinders, compaction trucks, and pneumatic collection systems of waste from households and industries. Meanwhile, this significant development was also witnessed by the construction of the first refuse incineration plant called 'Destructor', which was built in Nottingham, UK, in the year 1874, and was reciprocated in 15% of major American cities according to Awomeso et al (2010). Even then, it was gathered that waste disposal methods were still open dumping on land and in rivers and streams (Britannica Corporate Site, 2001; Pakistan Environmental Protection Agency, 2005). This was similar to the study according to Ndubuisi et al. (2016) that federal agencies in the 1970's had little authority to regulate hazardous waste disposed in landfills or in inclined lagoons causing serious pollution on the ground and in surface waters. For this reason, many countries began to introduce sanitary landfills to reduce the habit of improper incineration and prevention of open dumping on land, rivers and streams at that time. Subsequently, the refuse incineration plants were designed to trap and recover energy from the waste as well as to prevent extensive air pollution according to standard regulatory procedures (Awomeso et al, 2010). These standard regulatory procedures are ways to sustainable waste disposal and management. Sustainable waste disposal and management have been widely accepted as ways to stabilize the development of the environment, society, and economy. Achieving sustainable waste management in Nigeria should be a collaborative effort of different stakeholders, including researchers, environmental managers, and policymakers.

5.3 Waste Management and Waste Hierarchy Guideline

Waste management is an important issue in the world today since the high volume of waste is correlated to population growth (Ndubuisi et al., 2016). The increasing waste generation is characterized by endless human wants. Hence, environmental managers, policymakers, and all stakeholders need to adopt sustainable waste management action plans that will align with the use of waste hierarchy guidelines in order to achieved waste minimization.

5.4 Waste Hierarchy Guidelines

The evolution of waste hierarchy guidelines discussion can be traced back to the 1970s, as the practices of waste management systems were criticized by various environmental movements (Johan and Hervé, 2011). In this discussion, it was argued that waste should be treated in different fractions rather than burning, disposal, or incineration. Moreover, out of this discussion, the concept of waste hierarchy was generated in pursuits of environmental sustainability and best environmental outcomes. The waste hierarchy guideline is a vital element that forms the basis of a sustainable waste management policy that is globally accepted (ISWA, n.d.). Hence, the waste hierarchy guidelines structured the ranking of waste management options in achieving waste prevention from the source of generation as well as seeking to reduce, recover and recycle before disposal (Gharfalkar, et al., 2015) (see figure 13).

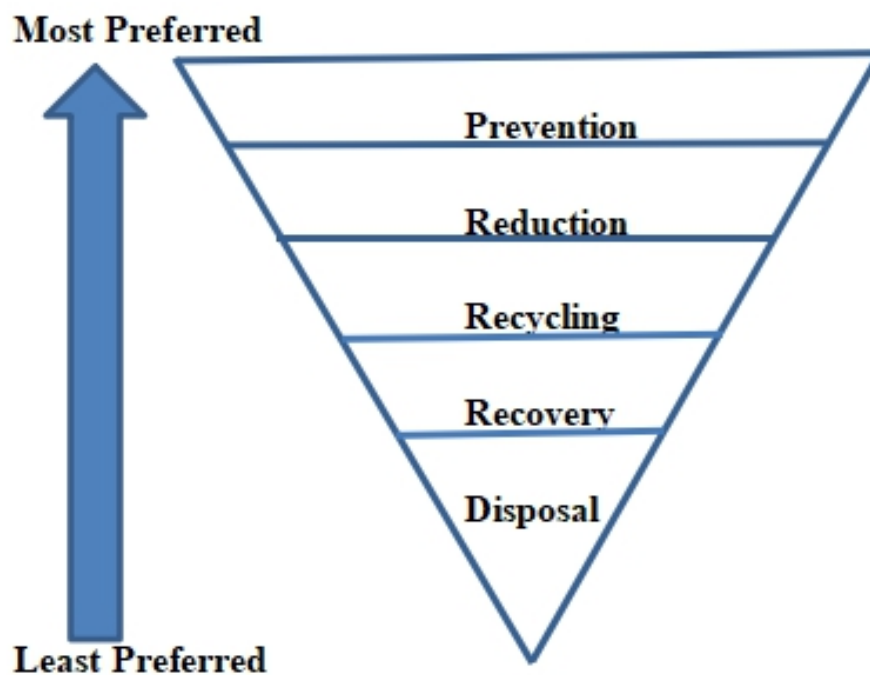


Figure 13: The Waste Management Hierarchy

Source: Researcher input

The European Economic Community (EEC) in 1975 – now the EU (European Union) – gave directive 1975/442/EEC on waste management to adopt the waste hierarchy concept into the European waste policy framework (European Commission, 2008). During this time, the concept of this directive emphasized the importance of waste minimization, environmental protection, and human health. Following these directives, the European Union members adopted this policy framework on the waste hierarchy

concept into their legislation. In 1989 the waste hierarchy was formalized into the management of 3Rs options as reduce, reuse and recycle according to the European Commission's Community Strategy and recommended for further review due to pressure from various environmental groups, academics and researchers.

The European Union in 2008 revised the waste legislation and re-introduced a new Directive 2008/98/EC that gave priority to the 5-tier waste hierarchy guidelines (European Commission, 2008). Furthermore, the new EU's waste hierarchy incorporates zero-waste guidelines through prevention, preparing for re-use, recycling, recovery, and disposal, which becomes acceptable by all other 28 members that formed the European Union. Likewise, as described in the master thesis of Muyiwa (2018), the United States Environmental Protection Agency (EPA) in 1989 adopted the 4-tier waste hierarchy to form the basis of state recycling laws. The 4-tier waste hierarchy adopted the ranking from reducing, re-use, recycle, recovery energy, and disposal (O'Brien, 2008). From then on, the waste hierarchy guidelines formulated the basis of waste legislation and policies in every state in the USA. Also, it was reported that the Canadian Council of Ministers of Environment (CCME) adopted the idea of 3-tier hierarchical waste management guidelines with order ranking of reducing, reuse and recycle, (Giroux & Bury, 2014). Consequently, it is pertinent and undeniable to mention that the influence of adopting the waste hierarchy guidelines has reflected positively towards the management of waste in these developed countries.

5.4.1 Prevention

As documented in the EU Waste Framework Directive 2008/98/EC, prevention is simply defined as measures taken before a substance, material or product has become waste. These measures reduce harmful substances, the quantity of waste, and the adverse impacts of generating waste through re-use of products or the extension of the life span of the products (European Commission, 2008). Similarly, the US EPA (2017) incorporated the options of waste prevention to achieve the aims of reduction and reuse of materials, products, and packaging items, etc. This indistinguishable circumstance was also noticed in Canadian waste policy, where waste prevention option was achieved through the use of 3Rs reduce, reuse, and recycle of waste before disposal (Giroux & Bury, 2014). However, it is thoughtful to educate Nigeria's citizens to consider the habits of waste prevention as a method to maintain the purpose of introducing the waste hierarchy.

5.4.2 Preparing for reuse

As directed by the EU Waste Framework Directive 2008/98/EC these forms of products or materials can be reused for the same purpose at which they were manufactured to avoid becoming waste (European Commission, 2008). Similarly, this option of reuse covers the first option of the US EPA waste hierarchy guideline. Meanwhile, reuse follows as a second option in the Canadian 3Rs waste hierarchy mission. Reuse products or materials are not categorized as waste because they are used the second time. Hence, in developing countries especially in Nigeria reused items are being rummaged out by the scavengers operating on dumpsites. Meanwhile, the idea of these reused items being rummaged on by the scavengers is a danger to human health, especially on dumpsites. For this reason, the researcher can suggest salvage centers where materials for reused can be stored, sold, or given away in Lagos State.

5.4.3 Recycle

This process involves the collection, processing of discarded materials or products for re-manufacturing. This operation requires the reprocess and regeneration of waste materials into other useful products or materials into the economic cycle (European Commission, 2008). The recycling process depends basically on the types of waste and its fabric content (The Open University, England, 2017). An example is seen in many European countries where high rates of plastic recycling were achieved. Furthermore, the Canadian waste hierarchy policy has also demonstrated a high rate of plastic recycling through the use of the 3Rs waste hierarchy mission. Hence, recycling is seen as one of the options to reduce waste especially in Lagos state where private and government recycling plants can be established.

5.4.4 Recovery

In Europe, the EU Waste Framework Directive 2008/98/EC described the recovery system as a way to use waste materials or products for another useful purpose. The Directive of the EU enlisted energy generation as one of such results of using waste materials through recovery (European Commission, 2008). An example of this was seen as food waste and other organic materials to produce biogas (Filho & Kovaleva, 2015). Likewise, Sweden has demonstrated the capacity in achieving a high recovery rate of most of its waste materials and products from households. They have nearly converted all recovered waste materials for the purpose of energy generation (Swedish Institute,

2013-2018). Also, energy recovery is seen as one of the options to reduce waste and the opportunity to generate more energy especially in Nigeria where energy demand is increasing.

5.4.5 Disposal

Despite being widely considered as the least desirable option, the most prevalent approach to dispose of waste is the utilization of landfills. Many developed countries utilize sanitary landfills or controlled landfills which are still classified as unsustainable. Meanwhile, the US EPA (2017), and EU Waste policy Framework gives directives on the proper treatment of landfills before disposal of new waste on-site. These directives have helped to control pollution through groundwater, soil, and containment of greenhouse gases which could endanger human life and the environment. Although developed country like Germany has set a time frame to close down all its landfills to end the possibilities of waste disposal option. In opposition, several studies by Agbesola (2013), Ndubuisis-Okolo et al. (2016), Abila & Kantola (2013), Kofoworola (2006) and Batagarawa (2011) have highlighted unsustainable waste management in Nigeria among which open dumpsites are seen as a practice that endangers human life and the environment. Then, it is necessary to reform the Nigerian policy on waste disposal to avoid continuous environmental problems such as groundwater contamination and pollution, etc.

CHAPTER SIX: OVERVIEW OF WASTE MANAGEMENT SYSTEM IN NIGERIA AND LAGOS STATE.

6.0 Introduction

This chapter gives an overview of the structure and the practices of the waste management system in Nigeria and Lagos state.

6.1 Brief History of Waste Management in Nigeria

The federal system of government in Nigeria allows every state to manage and protect its environment. This is similar to the existing waste management practices in Germany and Canada. Although, the Federal Environmental Protection Agency Act of 1988 under military rule allows the creation of counterpart ministries at every state and local government to manage, protect, and improve its environment. Subsequently, this was achievable in every state by setting up its own environmental ministry to protect the environment within its jurisdiction. Similarly, this implies that every state under this act has the functional responsibility to manage its own waste. Also, this Federal Environmental Protection Agency Act of 1988 still allows the federal government to administer, enforce, and regulate various environmental laws as seen in box 0.1.

Box 0.1 Federal Environmental Protection Agency Act Functions

- (i) Study the most reliable systems that are appropriate for local, domestic, and industrial waste management.
- (ii) Specify waste disposal and treatment methods that take into consideration the geological and environmental setting and encourages recycling.
- (iii) Specify waste disposal sites that guarantee the safety of the surface and underground water systems.
- (iv) Set up and enforce standards for adequate sanitary facilities for the disposal of human and solid wastes in dwellings, housing estates, and public facilities in both urban and rural areas.
- (v) Establish a monitoring program, including periodic surveillance for waste disposal sites and their surroundings and wastewater systems.
- (vi) Establish monitoring stations for the control of the disposal of leachate from dumpsites into surface water and groundwater systems.

Consequently, upon the commemoration of a democratic rule on May 29th, 1999, these acts were taken over by the Nigerian Federal Ministry of Environment and conformed with the additional responsibility of environmental laws, policies, and regulations. Even, since the additional responsibility was conformed to the portfolio of the federal ministry, many Nigerian states still witness various environmental problems among which are improper waste disposal and management. This brought about the intervention of the federal ministry by setting up integrated municipal solid waste management programs in different states including Lagos State. Among the factors of these programs are the indiscriminate disposal habits of the resident, improper collection systems, insufficient collection trucks, and lack of institutional agreements which constituted poor solid waste management in Nigeria. Although, those programs have sustained the waste management system in Nigeria to a certain level yet, a sustainable waste management system has not been achieved. Nevertheless, as Lagos state is rapidly transforming into a mega-city, there is a need to integrate sustainable waste management plans that will cope with the increasing waste in order to prevent environmental degradation. However, those plans should be enforced and monitored over a long period of time frame.

6.2 Brief Review on Administration and Organization of Waste Management in Lagos State

The Lagos State Waste Management Authority (LAWMA) is the agency responsible for the management of waste in the state. The agency is under the administration of the Lagos state ministry of the environment, which carries out the responsibility of collection, transportation, and disposal of waste with the aim of achieving positive living conditions with regard to environmental sustainability and sanitation. The ministry of environment is responsible for the establishment of the institutional framework with authority, financial powers, and advisory capacity to extend effective solid waste management in the state. Most LAWMA services are provided through public-private partnerships (PPP) which are directed by international and local investors to manage the waste in Lagos State. Furthermore, those services were decentralized for the purpose of achieving maximum productivity regarding the collection, management, and disposal of the waste (Lawal, 2010). Moreover, the management of waste in Lagos state has received considerable attention from numerous alliances and actors in order to achieve sustainable waste management in the state (see Box 0.2).

Box 0.2 Actors Involved in Waste Management

- Public sector: this comprises the local authority and local public departments at the city level.
- Private-formal sector: this constitutes large and small registered enterprises doing the collection, transport, treatment, and disposal, and recycling.
- Private-informal sector: this constitutes the small-scale, non-recognized private sector and comprises waste-pickers, dump pickers, itinerant-waste buyers, traders, and non-registered small-scale enterprises.
- Community representatives in the form of NGOs, etc

Nevertheless, those actors enter into partnerships in providing various services to LAWMA in Lagos state (see box 0.3). Other governmental institutions having shared responsibility with LAWMA to protect and manage the environment are described in box 0.4 together with their roles.

Box 0.3 Possible Combinations of Partnerships in LAWMA in Lagos State

- Public-private (Local Authority and private enterprises).
- Public-community (Local Authority and NGOs)
- Private-private (waste-pickers, itinerant-waste buyers, waste traders and dealers, wholesalers, small scale and large-scale recycling enterprises); and
- Public-private-community (Local Authority, private enterprises and NGOs)

Box 0.4 Ministry Working with LAWMA to Protection the Environment

Lagos Lagos State Environmental Protection Agency (LASEPA):

Function: To protect and improve the environment, assist public and private organizations, industries, businesses and non-governmental organizations to achieve compliance by providing environment-friendly solutions to varied environmental challenges.

Local Government Councils (LGCs):

Function: To deliver a broad range of services concerning roads; traffic; planning; housing; economic and community development; environment, recreation and amenity services; fire services and maintaining the register of electors.

Lagos State Ministry of Environment and Physical Planning (LASMEPP):

Function: To be responsible in all sectors and environmental media including air pollution and monitoring of ambient air quality.

Lagos State Ministry of Physical Planning and Urban Development (LAMPPUD):

Function: To plan, devise and implement the state policies on Physical Planning and Urban Development.

Lagos State Ministry of Information (LSMI):

Function: To plan, devise and implement the state policies on Information and Strategy.

Lagos State Ministry of Works and Infrastructure (LSMWI):

Function: To plan, devise and implement the state policies on works and infrastructural developments.

Besides, there are many additional private initiatives provided by some residents in order to achieve sustainable waste management in Lagos state. Even, with the effort of the relevant institutions and private initiatives, the questions of sustainable waste management in Lagos state are persisting as a lack of sorting systems, recycling processes, unsafe manners of solid disposal, inadequate transport vehicles and administration problems, etc. All this could be attributed to a weak institutional framework in working together (Longe, Longe & Ukpebor, 2009). Hence, this weak institutional framework in working together happened in Lagos State in the years 2017 and 2018. There was some disagreement between relevant investors including international and local groups working in partnership with LAWMA. Although, before the intervention of the international investors into the waste business services in Lagos state, the existing co-operations were between the LAWMA and the local groups of investors commonly known as Private Sector Participants (PSPs) operators. Hence, the waste business services of PSPs operators have improved the waste collection, management, and disposal to a certain level in Lagos State (Idowu, Omirin & Osagie, 2011). The cooperation has played a major role in waste deposition at landfills and dumpsites. Nevertheless, the process of managing the landfills and dumpsites was not sustainable as it was expected. For this reason, there was a cooperation between the government and the international investors who agreed on sustainable solutions to waste in Lagos State. Yet, the international investors deployed through the then government decided to go into the business of waste collections which were latterly done through PSPs operators. Then, this led to rivalry in waste collection services between the

PSPs operators and the International investors. Furthermore, this evolved other waste management problems leading to littering and dumping of waste in all corners of the streets in the Lagos environment. However, this situation degenerated into a state discussion which was later resolved through the intervention of the policymakers. Therefore, to achieve sustainable waste management in Lagos state, there is a need to integrate proper role definition through environmental corporate responsibility and awareness.

6.3 Current Waste Treatment in Lagos State

Waste treatment in Lagos state occurs directly by open burning on landfill sites which takes place in an unsustainable manner causing environmental pollution as well as posing a risk to the health of the residents. Furthermore, Lagos state operates mainly three landfill sites also known as dumpsites, which are situated at Oloshosun, Agege, and Iyana-Iba where the method of combustion is used. Dumpsites are regarded as one of the least cheap options for managing urban waste which involves creating an open land space where rubbish and garbage are disposed of or filled in. However, waste treatments are mainly done by burning on dumpsites in Lagos state to reduce the volume of waste. The open burning releases some toxic materials such as carbon dioxide, carbon monoxide, nitrogen dioxide, nitrogen monoxide due to the burning of remnants of chemicals in bottles and other containers, which are very dangerous to human health. The burning of plastic materials also releases some dioxins and furans. The continuous burning of waste has decreased the cost of rent and value of property in those areas due to environmental contamination and pollution. Also, the researcher can assume that the increase in settlement of the residents close to the dumpsites could be characterized by cheap rent costs. One danger of settling near the dumpsite was reported in an outbreak of fire at Oloshosun dumpsite in 2018 (fig. 14) (www.von.gov.ng).



Figure 14: Fire Outbreak at Olusosun Landfill in Lagos State in 2018

Source: www.von.gov.ng

This fire outbreak destroyed some vehicles, refuse evacuation trucks and goods in a nearby warehouse, which were worth millions of Naira in Nigerian currency. Thus, to achieve the projected Lagos smart city, it is necessary to integrate a sustainable master plan for waste treatment and management in the environment.

6.4 Plastic Waste Management in Lagos State

According to the administrative structure, LAWMA is responsible for assigning the directives for collection, transportation, and disposal of waste services in close collaboration with the PSPs operators. Hence, the collection of waste includes recyclable items like plastic waste which are all transported and disposed of to various dumpsites in Lagos state. Meanwhile, the PSPs operators are charged updates with developing their master plans for waste collection services within their assigned jurisdictions and collecting some specific amounts as waste collection services fee. Thus, this means that waste collectors move around with their waste trucks to collect waste within their assigned jurisdictions. The collection is done with complete mixed fractions of all waste together mainly with the waste bag, sack bag, and plastic bucket (figures 15 and 16).



Figure 15 and16: Waste Collection System in Lagos State

Source: Researcher input

As also seen in figures 15 and 16 there was no separation or sorting of waste as it is being collected from households. Waste is prepared to be transported directly to the dumpsites. Neither plastic nor any other form of waste is sorted. It was also observed that individual residents purchase disposal waste bins themselves to dispose of their waste while they await the arrival of the waste collection trucks. Although, the government distributed waste disposal bins but only for limited residents. This practice is regarded as insufficient(see figures 17 and 18)



Figures 17 and 18: Disposal Waste Bins are Used by Some Residents in Lagos State

Source: Researcher input

Therefore, the integration of sustainable waste management systems will promote proper recycling facilities for plastic waste. Hence, it is the duty of the Lagos state government to protect the environment through the integration of strategies, parameters, and components as proposed in this research work.

6.4.1 Plastic Waste Collection, Sorting and Recycling in Lagos State

Collection, recovery, and sorting of plastic waste are done by the waste pickers known as scavengers and other private business enterprises such as large- and small-scale industries (see figure 19). Furthermore, scavengers don't only recover plastics but also other valuable materials like aluminum, scraps metal, glass, paper, etc. Hence, the researcher will discuss the activities of scavengers as following

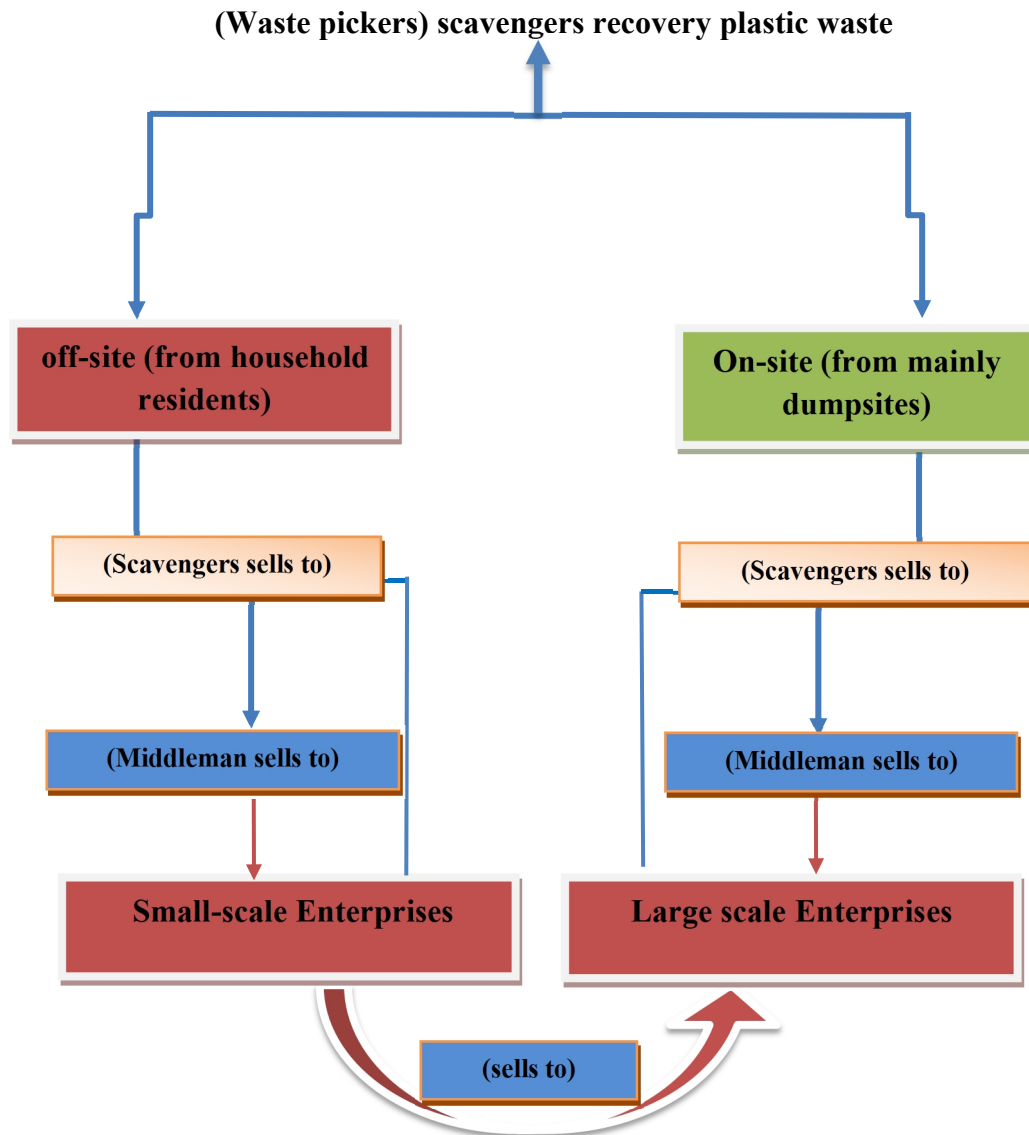


Figure 19: Scavengers Recovery and Selling of Plastics Waste

Source: Researcher input

6.4.2 Activities of Scavengers

The activities of the scavengers are divided into two parts which are mainly off-site and on-site waste plastic recovery. The off-site waste recovery system requires the scavengers going from residents' homes to collect and recover plastic waste through scrambling from waste bins as they are deposited outside awaiting the waste collector trucks. In contrary to this, the scavengers also purchase recyclable materials including metals from the residents at a negotiated price if the residents decide to sell (see figure 20).



Figure 20: Scavenger Negotiating to Buy Metal Scrap

Source: Agbesola (2013)

The on-site waste recovery system also requires the scavengers to collect and sorting of plastic waste by scrambling on the dumpsites. As previously mentioned, they recover not only plastics but other materials like aluminum, scraps metal, glass, a paper which are valuable materials. Scavenging (waste picking) becomes a major source of livelihood for some peoples. It was observed from the researcher's field studies that the high rate of unemployment in Nigeria appears to be the main reason why some individuals have decided to take up the scavenging activity as a source of livelihood. Although, the activities of scavengers are regulated by the dumpsites manager to avoid disagreement among each other while scrambling for valuable recyclable materials. Meanwhile, the dumpsites managers are also responsible for the safety and environmental maintenance of the dump as waste is been disposed of. Also, regulating the scavenger's activities is done on dumpsites by allowing only registered members to pick their valuable materials. In this regard, the scavengers scramble on each offloading waste collector truck and they will be stopped as soon as the next waste truck will offload or as the waste rear loader starts with its operation on leveling the waste (see figures 21 and 22)



Figures 21 and 22: Activities of Scavengers on a Dumpsite in Lagos State

Source: Researcher input

Each scavenger searches and sorts out plastic waste such as plastic bottles, sachet water, and other forms of recyclable materials as it is of interest on the dumpsites before selling it to the resource merchants (middleman) or the recycling industries enterprises (large- and small-scale industries). Many scavengers are living in self-built makeshift houses located around the dumpsites, which makes them exposed to pollution of all kinds as well as dangerous animals that inhabit the dumpsites. Also, many of the scavengers are exposed to various infections as a result of cuts by sharp objects due to the unprotected manner of scrambling for valuable waste materials on the dumpsites. Furthermore, the researcher gathered during field observation that some scavengers make an average monthly income between 30,000 and 40,000 Naira (20-30 Euro and 25-35 US-dollars) through selling sorted plastic materials and other valuable items to the middlemen or the recycling companies. Both the recycling companies and middlemen view the activities of scavengers as environmentally and economically beneficial. The disadvantages of scavengers' activities exist, as some of them were engaged in robbery activities as the information was gathered during the field research only but not proving. Despite this, the previous government has tried to improve the working conditions of the scavengers through the introduction of an initiative as a plastics buyback scheme by building up a plastic recycling facility on the dumpsites (see figures 23 and 24).



Figures 23, 24: Olushosun Buy-Back Recycling Facility (Lagos State Government)

Source: www.lawma.gov.ng

This initiative enables the scavengers to sell their sorted recyclable plastic waste back to the recycling facility on dumpsites which has worked for some time; however, it has since then collapsed due to government negligence and inadequate financial funding. This is an initiative that should have helped solve part of the plastic waste problem.

Nevertheless, Lagos state waste management authority must strengthen its policy towards the reuse and recycling economy of plastics.

6.4.3 Other Private Business Enterprises on Plastic Waste in Lagos State

During the field research, it was observed that large and small-scale business owners are involved in the recycling of the plastic waste in Lagos State. This business is divided into corporate or individual ownership depending on the size of its operations, the capacity of the working force, and with high or no technical knowledge and equipment. The large-scale corporate business involves large operational capacity, intensive investment with up-to-date technological input. Normally, they operate with official corporate business licenses as manufacturers, producers, and recycling of plastics. The larger scales business buy plastic waste from the small-scale companies, scavengers, and the middlemen who act in-between the scavengers and the recycling companies. The small-scale individual ownership activities involve small or medium operations capacity with no technical knowledge or skills expertise. More so, the small-scale individual has the right of ownership license and utilizes the activities of the waste scavengers and the middlemen to organize plastic waste. Many of the small-scale individuals have also developed their own strategies in recovering plastic waste from consumers and then sell directly to the large-scale industries. The researcher observed in Lagos state that small-scale individual ownership has played a vital role in the collection of plastic waste in the environment. Some of those small-scale enterprises like Envirocycles Ltd, We-cyclers, Recycling Point have built working strategies for plastic waste collections and recovery towards environmental sustainability and awareness. They have also established a business partnership relation with Lagos State Waste Management Authority (LAWMA) and some corporate organizations like Nigeria bottling company Ltd, Unilever, and so many others. They are responsible for the collection of recyclable materials such as plastic bottles and bags, sachet water, cans, paper directly from consumers with their planned collection methods. Thus, few of these small-scale planned collection methods function as a bonus system where every item collected from households or consumers accumulates to happy points and can be exchanged for a reward at various local designations redemption centers located in the areas. These initiatives have helped in minimizing plastic waste pollution and littering. It has also provided a large number of jobs for mostly unemployed youths in Lagos State. Then, the researcher can suggest that sustainable plastic waste management is achievable in Lagos if the proper polices are not

legislated. Hence, this research will propose some policies that will improve the management of plastic waste in Lagos State.

CHAPTER SEVEN: REVIEW ON CORPORATE SOCIAL RESPONSIBILITY ROLES IN PLASTICS PRODUCTION IN NIGERIA

7.0 Introduction

Chapter seven reviews the concept of corporate social responsibility, its components, and the activities of plastics and packaging industries in Lagos state. The chapter also presumably correlates the concept of corporate social responsibility and sustainable development in addressing plastics waste management.

7.1 Corporate Social Responsibility Concept

According to Fadun (2014), the concept of corporate social responsibility (CSR) entails issues of corporate citizenship, corporate social performance, corporate sustainability, ethical business practices, stakeholder management, depending on how it is been categorized by professionals or scholars. Since the early 1950's several scholars have suggested that corporate social responsibility should require any form of restitution to society without expectation, while few suggested otherwise. For example, it has been presumed that the concept of CSR should concern the management of responsibilities towards their employees, customers, and the general public. It has also been suggested that the concept of CSR should oblige business owners to comply with the environmental policy and regulation in line with the values of the society. Altogether, the aforementioned suggestions imply that the overall goal of CSR should be to improve community well-being through the contribution of corporate resources (Kotler and Lee, 2005). More recently, the CSR concept has been broadened to incorporate environmental sustainability. Zadek (2000) opined that corporate organizations engage in CSR strategies to: protect/defend their reputations; justify benefits over costs; integrate stakeholders into their strategies and understand risk management. In addition, corporate organizations were encouraged to engage in CSR activities through synergistic value creation, which promotes sustainable environmental and social wellbeing (Kurucz et al., 2008). Apparently, this was achievable as social movements which include civil, women's, and consumers' rights affiliated together with other environmental movements pressured corporate organizations towards environmentally sustainable pathways. Thereafter, this follows with some concessive agreement by corporate organizations to include environmental sustainability in their organization's dealings. Similarly, Carroll (1979, 1991) advocates that corporate organizations should have responsibilities, which

must be extended beyond the scopes of making a profit. Then, this advocacy reaffirmed with the finding of Carroll (1979, 1991) as he categorizes CRS into four model's components of responsibilities. Contingently, 'Carroll' represents his ideas by using a pyramid (Fadun, S.O, 2014) (See figure 25).



Figure 25: Represent Carroll's Pyramid of CSR

Source: Researcher input

In In this model of components, several scholars have used the basics of the terminology as described by Carroll. In addition, this has been proven by Aupperle (1984) and more recently by Schwartz & Carroll (2003) as well as Carroll & Buchholz (2011). They reported that a majority of the leading corporate organizations in the world have incorporated Carroll's four-part model of CSR components as part of their business responsibilities. Comparably, CSR benefits society, businesses, and the environment as categorized in these four components (Matten & Moon, 2008; Monowar & Humphrey, 2013). More so, CSR as described by Carroll (1991) defines the environmental sustainability performances of any business in the environment. Although, the

classification of CSR activities is still contentious, as the model has centralized its main focus on the importance of CSR components. Hence, Carroll's (1979, 1991) definition of CSR is a universal acceptable model (Geva, 2008; Carroll & Shabana, 2010; Taneja et al., 2011; Carroll & Buchholtz, 2011) according to (Fadun, 2014). Thus, it is necessary to correlate Carroll's four-part model of CSR components and the activities of Nigerian producers of packaged plastic bottles and sachets water in Lagos State.

7.2 Carroll's Four-Part Model of CSR Components and the Activities of Nigerian Producers of Packaged Plastic Bottles and Sachets Water in Lagos State

According to the finding of Carroll (1979, 1991), the four-part model of CSR components will be discussed briefly as it could help to solve the problem of plastics waste in Lagos State.

7.2.1 Economic Responsibilities

Many Many corporate organizations have their main focus on profit maximization (Fadun, 2014). Additionally, corporate organizations are obliged to ensure the company's financial position and return on invested capital, which represents economic responsibilities (Grankvist, 2012). Meanwhile, Carroll emphasizes that economic responsibility requires business organizations to be committed to profit maximization, high competitive value, and operating efficiency (Carroll, 1991). Larsson, Bratt & Sandahl (2011) have argued otherwise by saying that corporate organizations should not only be motivated for profit maximization but rather should obtain knowledge about the environmental balances of their activities through scientific research. This supports the assumptions of some ecological economists that focusing on profit maximization can lead to endless generations of environmental problems. In Nigeria, plastic waste is causing major environmental problems with the negligence of producers as their focus is only on the maximization of profit. In furtherance to this, the increasing plastic production output, without controlling its end products life cycle as waste has resulted in increasing plastics pollution in Nigeria. Moreover, there are no financial or legal responsibilities to the environmental problems of plastic waste caused by the producers. On this viewpoint, the researcher presumes that the activities of the producers in the plastic and packaging industries have intensified the current environmental peril of plastic pollution in Lagos State. Contrariwise, the economic responsibility should encourage sustainable production of plastics for various uses without generating waste. Thence, the producers should be held financially or legally accountable as their activities

are causing the environmental problem of plastic pollution. It is a necessity for producers of plastic bottles, bags, and sachet water to regulate their products life cycle as waste leading to plastic pollution despite maintaining high operational capacity, competitive market, and profit maximization.

7.2.2 Legal Responsibilities

Legal responsibilities require the fulfillment of basic notions to fair business operations as been promulgated within the legal system framework of the government (Fadun, 2014). Thus, corporate organizations are obliged to perform their responsibilities within the established laid-down regulations and laws by the legal system of their own countries. As suggested by Carroll (1991) legal responsibility embodies the need for corporate organizations to comply with the governmental laws and regulations established by the government. On this point, Carroll (1991) advocated that a successful corporate organization has fulfilled this obligation of legal responsibilities. Moreover, several scholars agreed that regulations and laws are mandatory for the fulfillment of CSR of any organization (Phillips et al., 2003; De Schutter, 2008). Similarly, it is expected of producers in the plastic and packaging industries to comply with existing environmental regulations and sustainability standards. For example, the German plastics and packaging industry especially, the German producers of packaged bottled water, and other items have integrated themselves under the umbrella of Green Dot in order to be responsible for recovery, sorting, and recycling of after-sales packaging plastic waste (see chapter 12). Likewise, the Canadian producers of packaged bottled water and other items integrate themselves mostly through the ongoing EPR policy. Contrarily to this, the absence or weakness in regulating the activities of Nigerian producers of packaged bottled water, and other items in plastics, has led to increasing pollution in Lagos State. The regulating agency in Lagos state that will enforce the penalties on producers is the Lagos state environmental protection Agency (LASEPA). Therefore, the researcher can presumably argue that there is an absence or weakness in legal responsibilities as a framework policy for producers on sustainable plastics and packaging uses. Thereupon, it is important for policymakers to introduce strict legislating and enforcing sanctions that will protect the environment, making it free of plastic waste in Lagos State.

7.2.3 Ethical Responsibilities

Many scholars assumed that ethical responsibilities refer to expected moral values that determine “right and wrong” in societies. In addition, ethical responsibilities incorporate the rules about fairness and justice according to social expectations (Fadun, 2014). Therefore, ethical responsibilities embrace values, norms, standards in practices even if they are not complying with the legal system guideline. Besides, it could be said that ethical responsibilities encircle the practices from economic and legal responsibilities with high moral demands and expectations. Moreover, the level of ethics, morals, and values also includes the high standard of environmental responsibilities. Nonetheless, there is a dependency on the level of responsibilities in-laws and regulations policies. On this account, it can be assumed that the Nigerian producers of packaged bottled water and other items in plastic have not executed what is expected of their moral values. Thus, the ethical responsibilities of the producers should be duly executed in Lagos state in order to prevent plastic waste from degrading the environment. The ethical responsibilities should also reflect in the resident’s daily habits of plastic waste disposal aggregating to pollution. Hence, it is expected of the Nigerian producers of packaged bottled water and other items in plastics to have a high standard of environmental responsibility towards waste generated from the products. The ethical responsibilities of the producers should be duly executed in Lagos state in order to prevent plastic waste from degrading the environment. It expected of the Nigerian producers of packaged bottled water and other items in plastics to have a high standard of environmental responsibility towards waste generated from the products. Likewise, the ethical responsible should also reflect in the consumers daily habits of plastic waste disposal aggregating to pollution.

7.2.4 Philanthropic Responsibilities

Philanthropic responsibilities are an important way of promoting human welfare through voluntary action or discretionary activities. Literally, philanthropic responsibilities are desirable measures taken by corporate organizations in order to improve society and environmental well-being. Thus, many corporate organizations promote their philanthropic activities by participation in volunteer activities, empowerment, and support of innovative programs. As advocated by Carroll (1991) philanthropic responsibilities should embark on charitable activities and voluntarily assist projects in order to impact the quality of life in society. Nevertheless, philanthropic responsibilities

are not mandatory but desirable with the preference of corporate organizations decisions. Hence, there is a similarity between philanthropic and ethical responsibilities but the only difference is that ethical components are expected in a moral sense, but philanthropic components are not required (Fadun, 2014). It is presumed that philanthropic responsibilities are a practical way of demonstrating good citizenship without altruistic motivations. If philanthropic responsibilities are desirable, producers in Lagos plastics and packaging industries should utilize the opportunity to coordinate voluntary community plastic waste clean-up across all community and local governments.

7.3 Correlating the Concept of CSR and Sustainable Development to Address Plastics Waste Management in Lagos State

Presumably, CSR is a dynamic concept that supports sustainable development, regardless of the motivations and approaches of corporate organizations. Although, the components of CSR as they are performed by corporate organizations should result in high grades of sustainability in a moral sense. This achievement could be measured through the three pillars of sustainability and sustainability development goals (SDGs). Although, the sustainability concept came into the limelight after many pressures from scholars about the growing environmental crisis in the last century. This led to the first-round table discussion called the United Nations Conference on the Human Environment (Stockholm Conference) in 1972 to the last round table discussion at the United Nations Sustainable Development Summit 2015 (New York). According to the UN declaration of 1987, sustainable development is defined “as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN, 1987). Thus, this concept of sustainable development encompasses social-economic development in line with ecological constraints and redistribution of resources to protect the quality of life for future generations. Therefore, the concept of “CSR” is more similar to “sustainability”. More so, the principle behind the sustainability concept is to maintain balance in the environment, society, and economy. In other words, the pillars of sustainability interact with each other to achieve the goals of sustainability. Similarly, the components of CSR interact together to fulfill the obligations and maintain a sustainable balance concerning the activities of corporate organizations. Despite this fact, the general definition of “sustainability” is more used in this recent time than “CSR” (Grankvist, 2012). To achieve a sustainable environment environmental awareness, knowledge and attitude must be enriched in the society. As it was said from

an assumption that when knowledge is passed, one is motivated to act. This supports the findings of Gouldson and Sullivan (2012) that there are links between knowledge to attitudes and attitudes to behavior. For this fact, the researcher agrees that the contributions of knowledge from environmental scholars, ecological economists, and social scientists are necessary to maintain balances in the environment. Certainly, the correlation between CSR and sustainability is as needful as it is represented in figure 26 and discussed below.

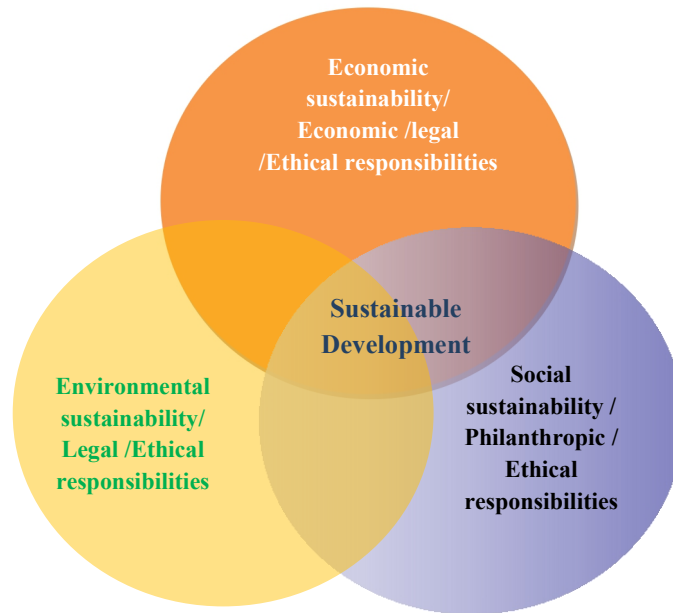


Figure 26: Correlating the Concept of CSR and Sustainable Development to Address Plastics Waste Management in Lagos State

Source: Researcher input

7.3.1 Economic Sustainability/ Economic /Legal /Ethical responsibilities

According to Basiago (1999), “economic sustainability” implies a system of production that satisfies present consumption levels without compromising future needs. Meanwhile, Grankvist (2012) emphasized that corporate organizations presume that economic responsibilities are to ensure balance in the company’s financial position and return on invested capital. In addition, Carroll highlights the responsibilities of corporate organizations as profit maximization, competitive market value, and operational effectiveness and efficiency. Carroll says that economic growth without considering the incorporation of the economic sustainability principle will result in serious environmental problems such as climate change, pollution, ozone layer depletion, and deforestation to mention a few. Today, these environmental predicaments have been witnessed in many countries due to economic growth without sustainability. Sadly, these

predicaments will continue if the economic sustainability principle is not adopted into corporate organizations agendas. Generally, producers in the plastics and packaging industry in Lagos state have limited their scope of productivity only to economic growth and profit maximization. Hence, economic sustainability and responsibilities should not be limited only to profit maximization in Nigeria without the sustainable conception of the natural environment. Likewise, it is the legal responsibility of policymakers to introduce a policy that will regulate the activities of the Nigerian producers of packaged bottled water, and other items in plastics. Similarly, the producer's ethical responsibilities should be determined by a high standard of environmental sustainability. Thereupon, it is essential for the plastics and packaging industry in Nigeria to adopt the principle of sustainability as part of their responsibilities in order to protect the natural environment.

7.3.2 Environmental sustainability / Legal /Ethical responsibilities

Environmental sustainability involves integrity, carrying capacity, and biodiversity of ecosystems (Basiago, 1999). Additionally, Grankvist (2012) suggested that corporate organizations must be environmentally conscious in running their business activities without degrading or over-exploring natural resources. This means that the sustainable exploration and use of resources must not be in conflict. Consequently, it is the obligation of Nigerian producers of packaged bottled water, and other items in plastics to ensure the sustainable uses of their resources without constituting environmental degradation. At the same time, it is a necessity for the producers to embark on preliminary measures that will guarantee environmental sustainability and responsibility. On the other hand, it is the ethical responsibility of the society to adopt moral values in consumption patterns, if environmental sustainability is needed to be achieved. Therefore, the absence of environmental sustainability in Nigeria has resulted in the on-going problems of plastic pollution in Lagos State. On one part, this could be attributed to the lack of ethical responsibilities which defines the moral values that are expected in society. On the other part, this could also be related to the negligence of required legal responsibilities and failures in waste management policy. As suggested by Larson et al. (2011) the lack of information and knowledge could be the reason why resources are becoming waste. For this reason, it is paramount to promote formal and informal environmental education and awareness for the purpose of reflecting ethics and moral value needed in society. Subsequently, it will be of significant importance for

policymakers to strengthen the waste management policy in order to protect the environment free of plastic waste in Lagos State.

7.3.3 Social sustainability / Philanthropic / Ethical responsibilities

According to Basiago (1999), “social sustainability” implies a system of social organization that alleviates poverty in order to improve the quality of human life. Grankvist (2012) opines that it is essential for corporate organizations to improve the quality of human life in societies by acknowledging their good citizenship. This opinion was supported by Ruttan (1991) that social sustainability focuses on improving human life through empowerment programs and educative innovations as well as poverty alleviation. For this reason, the researcher can suggest that philanthropic responsibilities are part of social sustainability. Hence, philanthropic responsibilities and social sustainability can eradicate poverty and hunger which supports sustainable development goals (SDG’s) agendas. In addition, social sustainability embodies the element of “obligation” which is similar to ethical responsibilities as expected of society. Hence, philanthropic responsibilities are a “desirable” decision element. Therefore, the aforementioned are the two features that differentiate philanthropic responsibilities and social sustainability. Then, the researcher can presumably argue that social sustainability would provide solutions to social and environmental problems. Therefore, producers in Nigeria’s plastics and packaging industries can adopt social sustainability with profound environmental solutions to solve plastic pollution.

CHAPTER EIGHT: BRIEF REVIEW ON ENVIRONMENTAL POLICIES INSTRUMENTS

8.0 Introduction

Chapter eight reviews the concept of Extended Producer Responsibility (EPR) and its application to plastic waste. The researcher also discusses the collection systems for plastic waste as well as the use of a ban and a levy as an option to minimize the increasing plastic bag pollution in Lagos State.

8.1 Extended Producer Responsibility (EPR) Concept

In developed countries, the implementation of Extended Producer Responsibility (EPR) schemes as a strategy has enhanced the re-use and recycling economy of plastics production through take-back for re-use, recycling, and final disposal of plastic waste. The implementation of this approach aims to prevent marine littering and other forms of plastic waste pollution in the environment, among other intended outcomes. Progressively, the concept of EPR was first introduced in the 1990s in a report to the Swedish Government by Thomas Lindhqvist while assessing the environmental costs and externalities of products end-life cycle (OECD, 2001). Thomas Lindhqvist defined the mechanisms by which EPR could be implemented. This was adopted and legislated successfully by the Swedish Ministry of Environment. As reported by OECD (2016) the concept of EPR has been widely accepted with over 400 EPR schemes been implemented at different levels in a global context (see figure 27).

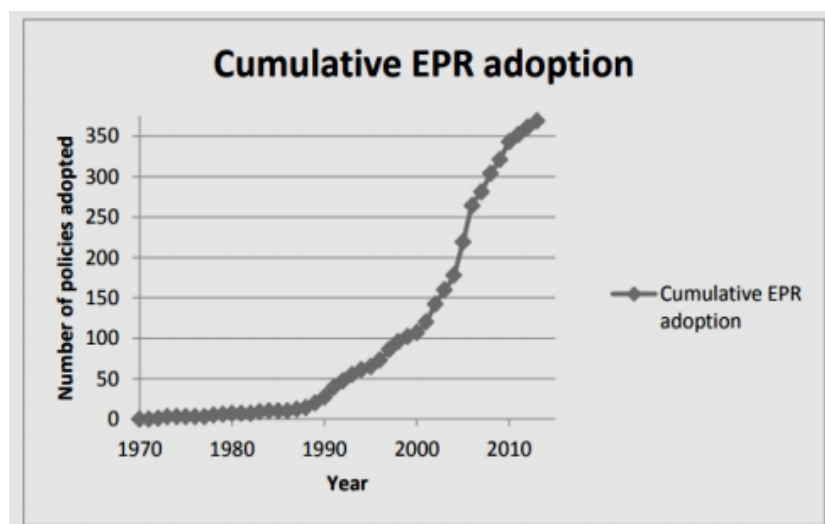


Figure 27: Cumulative Global EPR Policy Adoption Over Time

Source: Kaffine and O'Reilly (2015)

Lindhqvist (2000) defined EPR “as a policy principle to promote total life cycle and environmental improvements of product systems. Also, EPR obligates the manufacturers to extend their responsibilities to various parts of the entire life cycle of the product, which includes the take-back, recycling, and its final disposal (IEEP, 2017). Although there have been many other definitions concerning the EPR concept afterward, EPR as defined by Lindhqvist, embraces the purpose of preventing pollution by focusing on the entire life cycle. This implies that producers should be responsible for the entire life cycle of their products looking beyond the choice of raw materials, manufacturing processes, and the management of their product's life cycle as waste (Annexure, 2005).

Likewise, the producers must be responsible for the amount of waste and pollution costs created as a result of their production activities. As argued by Haskill (2004) all producers should be responsible for the product end life cycle from the point of production and after-sale production processes. In these instances, the producers should be obligated to take full responsibility for the environmental cost of their products life cycle. Moreover, the obligations of the EPR scheme also enforce producers/manufacturers to take up strategies such as incentives, redesigning of products, choice of packaging items, and raw materials for production processes (Annexure, 2005). Meanwhile, the concept of the EPR scheme encourages the prevention of waste, and pollution (Haskell, 2004). Consequently, the concept of the EPR scheme also transfers the responsibilities of environmental damage cost of products to the manufactures or producers and indirectly back to the consumers (IEEP, 2017). Similarly, the EPR scheme has supported the effective collection systems of plastics products as waste and sustainable environmental treatment of plastic end products for re-use and recycling economy (IEEP, 2017). This is an indication that the EPR scheme established the basics for plastics redesign which certainly will reduce environmental cost and externalities. Hence, the EPR scheme is not only limited to redesigning products for environmental benefit but also associated with the implementation of mandatory policy together with substantial infrastructures, institutions, and awareness, etc. Thus, it could also be suggested that the EPR scheme serves as one of the linking bridges from this present re-use/recycling economy to the future projected circular economy.

8.2. The Two Categories of the EPR Schemes

The researcher will further categorize the two EPR schemes in order to propose sustainable strategies that will be needed to minimize the increasing plastics pollution dilemma in Lagos state. Therefore, the two categories of the EPR schemes are discussed below.

8.2.1 Full EPR requires producers to meet the targets for collecting and recycling plastic materials they supply into a given market (David, 2018). In this manner, the producers are required to put forward all financial and operational responsibility for the collection and recycling of their plastic waste in the environment. Hence, the researcher will propose this full EPR as a strategy (see chapter 15, STRATEGY I and II).

8.2.2 Product Stewardship requires federal or state governments to impose “advanced disposal fees” on each plastic produced by the producers before supplying into the environment (David, 2018). This advance disposal fee will serve as revenues to fund the recycling program which will be handled by the state/provincial government or agency recommended by the state/provincial government. Hence, the researcher will not propose the product stewardship programs as part of the strategy because it takes a long period of time to be transformed into a full EPR scheme.

Consequently, the full EPR schemes have the capacity to force the producers to be financially or physically responsible for the end life-cycle impacts of their products on the environment. While the 'Product stewardship' option has the capacity to force the financial or physically responsible on consumers directly. Nevertheless, the two categorize of the EPR schemes can only be established. Thence, the roles and responsibilities (see chapter 7) of producers are of great impact towards establishing the EPR schemes. Therefore, it is a necessity to attain environmental sustainability with zero plastic waste in the environment. On this account, the researcher will describe the collection systems that can be adopted to manage plastic waste in Lagos State.

8.3 Collection Systems for Plastic Waste

The following collection systems that can be adopted to manage plastic waste in the context of plastic bottles, bags, and sachets water in Lagos State are discussed.

8.3.1 Deposit-Refund System

This kind of system requires the consumers to make deposits, whereas the deposits serve as refunds on particular products which was purchased (Quartey et al. 2015). However, the consumers have the obligation to receive back their initial deposit as financial reimbursement compensating for the return of empty plastic bottles. Hence, this is also called buy-back refund systems used in Germany and Canada to target the high collection rate of plastic beverage containers. Meanwhile, the deposit-refund systems are briefly discussed in box 0.5 below according to Lindhqvist's definition.

According to Lindhqvist (2000, p.28):

“Natural systems occurred because of the real value of the refillable container and the consequent desire of breweries and other fillers to recoup the container. The refund had to be high enough to motivate consumers to return the container instead of keeping it for their own purposes or throwing it away. With the changes in manufacturing technology, transport prices, salary levels, etc., the economic rationale of refillable bottles gradually disappeared, and one-way packaging rapidly expanded its market share. Triggered by the debate on energy and material wastefulness, combined with littering problems, individuals and society started to discuss the reintroduction of refillable containers and, along with them, deposit-refund systems. It was now in many cases not a question regarding a system where the fillers wanted the bottles because of their value, but rather that the bottles should be returned in order to fulfill societal objectives of reducing littering and combating wastefulness.

Consequently, the deposit-refund system became an ‘artificial system’ imposed on the market by societal concerns. Deposit-refund systems are in many instances seen as the best solution when very high collection rates are desired. The general notion seems to be that the existing deposit-refund systems are, overall, very successful in achieving high collection results. Many of the traditional deposit-refund systems for beer and soft drinks in refillable glass bottles are claimed, where they still exist, to lead to an almost 100% return rate. This is the case for the 33-centiliter glass bottles in Sweden¹⁹⁶ and Denmark. In these cases, as well as in other comparable countries (see Table 5-1 and Table 5-2), the refund sums are most often fairly modest, that is, in the order of USD 0.03-0.15.”

Thus, the researcher will propose the use of deposit-refund systems to target the high collection rate of plastic bottles (see chapter 15, STRATEGY I) with the application of the EPR scheme as part of the solution to the plastic waste problem in Lagos State.

8.3.2 Kerbside Collection System

This kind of system is accomplished by collecting empty plastic bottles close to consumers' homes or designated points assigned by the municipality (Quartey et al., 2015). This collection system is not different from the normal way of collecting household waste in Nigeria, Germany, and Canada. Meanwhile, the researcher will not propose this type of collection system as part of the strategy to manage plastic waste in Lagos State.

8.3.3 Voluntary Bring Back System

This system requires the consumers to voluntarily bring back their empty plastic bottles to collection or designated points, which are normally at walking distance from the home of the consumers (Quartey et al. 2015). This system is called a voluntary drop-off system. This research will not propose this system as the Nigerian citizen's levels of environmental education and awareness is not sufficient enough to adopt this type of collection system.

8.4 Ban and Levy on Plastic Bags

The researcher will also discuss the use of a ban and a levy as options to minimize the increasing plastic bag pollution in Lagos State.

8.4.1 Total or Outright Ban

The implementation of either total or an outright ban on plastic bags has been achieved in some countries. The EU including Germany has plans to ban plastic bags which is still ongoing. Likewise, in Canada, there are lots of plastic bag bans at the municipal level and provincial level. Also, African country like Rwanda has fully implemented a total ban on plastic bags. The implementation of a total ban on plastic bags in Rwanda has helped reduce littering, pollution, and consumption (Sharp et al, 2010; Clapp & Swanston, 2009). Hence, the researcher will subsequently discuss from literature reviews the implementation of the ban in Rwanda (section 12.4). Despite this, the research will not recommend the ban of plastic bags as an option in Lagos state due to its social-economic impacts that may have immediate effects on the societies. The cost of enforcing and monitoring the effectiveness and efficiency of this ban in Lagos state is additionally responsible to be considered as a factor in the process of not recommending the ban.

8.4.2 Levy

It has been presumed that levy has been successively used to regulate plastic bags in some countries around the world. Hence, the implementation of a levy on plastic bags can be used against the plastic littering habits of the consumers and the increasing output production of the producers. Thus, the levy is imposed as a fund to manage the recycling of discarded plastic bags. Moreover, some selected countries like Germany and Ireland have achieved many successes in the use of levy, especially on plastic bags. Therefore, the researcher will subsequently discuss from literature reviews the implementation of a levy on plastic bags in Ireland (see section 12.5). In this respect, the researcher will also propose the use of levy (see section 15.3, STRATEGY III) as a policy instrument to regulate plastic bag pollution in Lagos State.

CHAPTER NINE: PROFILE OF THE STUDY AND INVESTIGATED AREAS

9.0 Introduction

This chapter describes the profile of the study and investigated areas in order to glean more information. The variables analyzed includes physical and socio-economic environment such as location and size, demographic characteristics, climate and meteorology, ethnicity and religion, etc. The chapter also briefly discusses the profile of the investigated areas like Germany and some selected provinces like Saskatchewan (SK), Alberta (AB), British Columbia (BC) in Canada, Rwanda, and Ireland.

9.1 Location and Size

As shown in figure 28, Lagos state is identified as one of the most rapidly growing cities in the world (LBS, 2010). It consists of 20 local government areas (LGA), 57 Local council development areas (LCDA) with the total population projected at 23 million in 2015 (Demographic Dividend - Lagos State Government, 2015). The state lies in the south-western part of Nigeria sharing boundaries with neighboring states and also lies along the Guinea Coast of the Atlantic Ocean (Lagos Eko project, 2013). The city is known as the commercial center of Nigeria with a population density of 5,926 persons per square kilometer (Oshodi, 2013). The city is important to its neighboring states in the country, because of its seaport, production, and manufacturing centers with the highest number of multinational companies (Phillips and Horwood, 2007).

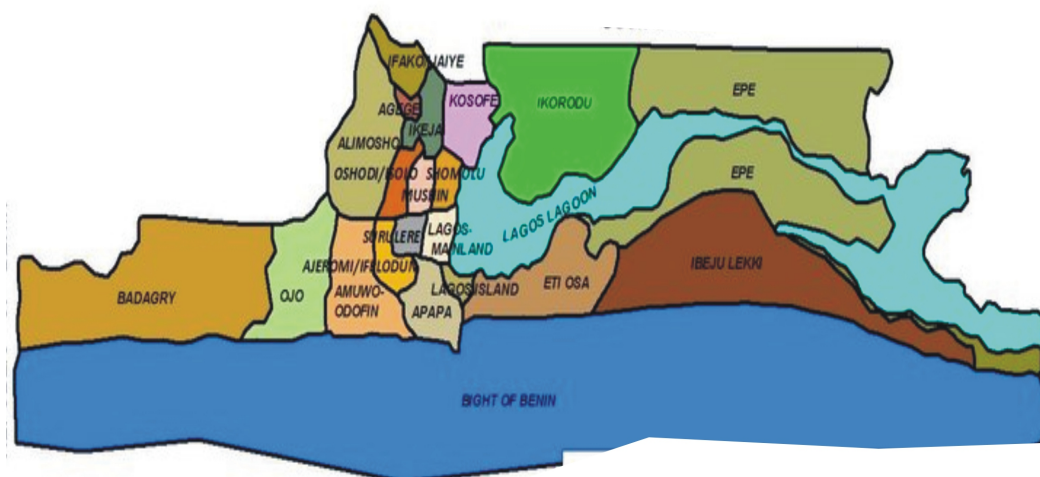


Figure 28: Map of Lagos State and its Local Government Areas

Source: Ministry-of-Physical-Planning, Lagos State

9.2 Socio-Economic Environment

The following sections discuss the socio-economic and environmental characteristics.

9.2.1 Demographic Characteristics

The rate of population growth is about 600,000 per annum with a population density of 5,926 persons per square kilometer (Oshodi, 2013). As reported by the Lagos Eko Project (2013) the metropolitan area of the state covers about 37% of the landmass and accounts for about 85% of the city population residents. Lagos state is growing faster with increasing population, urbanization, and industrialization. The growth rate and the density of the population have serious implications on waste generation and management. This could explain why out of the 10,000 plus metric tonnes of waste generated in Lagos per day, 12% consist of plastic waste.

9.2.2 Ethnicity and Religion diversity

Lagos state is characterized by several ethnic and religious groups. The indigenous inhabitants include the Aworis and Badagry (Lagos Eko project, 2013). The Aworis and Badagry areas are known for their state heritage and culture. Meanwhile, other pioneer settlers such as indigenes of Ikorodu and Epe are also part of the state heritage. Lagos is essentially a Yoruba-speaking area while some settlers from other parts of the country also speak Hausa and Igbo respectively. Hence, English remains the official language in the state due to British colonization history. More so, religious activities in the state are categorized into Islamic, Christianity, and some traditional beliefs are also factors to be considered in this research.

9.2.3 Economics

Lagos state was the former federal capital of Nigeria. The state still maintains its potential activities as the commercial, financial, and business center of Nigeria despite the movement of the federal capital to Abuja. Lagos state remains among one the wealthy economic states of the country with an increasing population due to its urbanization and industrialization capacity. This city consists of many manufacturers and producers of goods and services such as electronics, chemicals, beer, food processing, and textiles materials, etc. (Lagos Eko Project, 2013). The manufacturing companies which include the plastic and packaging industries in Lagos state, use plastic as basic materials without proper management which also attests to the aggravating problems of plastic waste.

9.2.4 Education

There are 1,050 public primary schools, 311 public junior secondary schools, 307 public senior secondary schools, and 6,251 private primary and secondary schools in Lagos (Lagos Eko Project, 2013). The schools are either government or private-owned as Pre-primary, Primary, junior secondary schools, and senior secondary schools are enrolled in by both boys and girls. Simultaneously, environmental education and awareness in schools are aspects that are essential in this research.

9.2.5 Water Sources

Water sources in Lagos are mainly provided by public taps, boreholes, and yard water wells. Few of the residents who have no access to clean water, use streams and rivers as their water sources (Lagos Eko Project, 2013). Meanwhile, the urban residents patronize vendors to purchase potable drinking water mostly in plastic bottles and sachet drinking water due to inadequate urban water supply. Thus, the indiscriminate disposal of plastic end products by the residents has become pervasive which thus exacerbates the level of plastic pollution.

9.2.6 Electricity Supply

Electricity is provided in the state through the Power Holding Company of Nigeria (PHCN) (Lagos Eko Project, 2013). Hence, the generation of electricity is from the Kainji Dam which is located in the northern part of Nigeria. Although, the power supply in the Lagos state is not stable. This could explain why many residents are using generators as an alternative power supply during electricity shortage. Therefore, the conversion of plastic waste to energy is a possible solution for the generation of electricity supply.

9.3 Physical Environment

9.3.1 Climate and Meteorology

Lagos climate is influenced by prevailing winds and its nearness to the Atlantic Ocean. The two dominant air masses are the dry wind from the Sahara and the wet from the Atlantic Ocean (Lagos Eko Project, 2013). The marginal alterations have been recorded due to landform characteristics, dominant ocean currents, the configuration of the surrounding shoreline, and the topography of the region (Lagos Eko Project, 2013). These are imperative elements that are necessary for this research.

9.3.2 Rainfall

Lagos state is dominated by two distinct rainy seasons; the more intense rainy season occurs between April and July, while the mild season is from October to November (Lagos Eko Project, 2013). At the peak of the rainy season, many plastic wastes are littering the streets, clogging drainage systems, and polluting the waterways, which intensifies the problems of plastic pollution in the state.

9.3.3 Temperature

The temperature in Lagos varies throughout the year. The highest temperature stays between 29°-37°C, while the lowest at 14°-25°C (Lagos Eko project, 2013). The highest value of temperature is normally recorded between April and March while the lowest value is recorded between December and February. The slight decline around December is due to the chilling effect of the in-coming northeast wind from the Sahara region called Harmattan (Lagos Eko project, 2013). These are significant elements accounting for sustainable plastic waste management.

9.3.4 Wind

Wind in Lagos state also varies according to the seasons. Moreover, the wind from the South-west lies dominantly during the wet period of the year in Lagos while the northeast lies dominantly during the dry season. Also, this is a result of shifts in the pressure belts from the Atlantic Ocean to its nearness to the Sahara region. The monthly wind speed varies between 2.7 m/s and 4.4 m/s, in the months of the “dry” period (November - March) it is lower (Lagos Eko Project, 2013). However, in the wet period of April–October, the daily average speed could rise from 15 m/s to 25 m/s due to inducement by convective rainfall season and relative diffusion (Lagos Eko Project, 2013). Therefore, it is important to understand the effect of the wind due to plastic waste littering in the environment.

9.3.5 Ambient Air Quality

Air quality in Lagos state does not fully comply with the standard regulation (Lagos Eko Project, 2013). This is a result of human activities such as open-air burning of waste in the dumpsites and landfills, emission from old vehicles, use of industrial generators, and other heavy industrial activities such as daily production and manufacturing that are

ongoing in the state. All of these are indications of anthropogenic impacts that affect air quality and can cause serious health damage to Lagos residents.

9.3.6 Water Quality

Lagos is surrounded by water bodies such as lagoons, rivers, creeks, and swamps, which reduces its land surfaces for human habitation (Lagos Eko Project, 2013). Normally, the water bodies are contaminated by many anthropogenic activities, which include plastic littering and point-source pollution. Presumably, this can be attributed to the improper disposal of plastic waste by the residents which thus weakens the waste management policy of the state.

9.4. Brief Profile of Investigated Areas

The section briefly discusses the profile of the investigated areas like Germany and some selected Canadian provinces like Saskatchewan, Alberta, British Columbia.

9.4.1 Brief Germany Profile at a Glance

The Federal Republic of Germany has a population estimated at more than 82 million people (Sascha, 2017) and a long tradition of federalism (Ziblatt 2004; Broscheck 2011). Germany has the largest economy in Europe (Sascha, 2017) and is sharing boundaries with other European countries and also lies close to the North and Baltic sea (see figure 29).



Figure 29: Germany and its states

Source: <https://www.theodora.com/maps/>

German waste management systems have vast shared responsibilities enacted and legislated at the national and then passed across to the regional and local levels. Although, the regional levels comprise 16 federal states and each of those states have their constituted authorities to legislate strict waste management policies. However, among the strict legislated policies are the EPR schemes that were implemented to solve parts of the plastic waste problems in Germany. Thence, the process of implementing the EPR schemes in Germany (see chapter 12) is of importance to this research.

9.4.2 Brief Saskatchewan Profile at a Glance

Saskatchewan is one of the Canadian provinces without a saltwater coast, and whose boundaries are all wholly artificial (Saskatchewan SINP; figure 30). According to Census (2016), the total population in Saskatchewan was estimated at more than one million people. Also, the province was incorporated on September 1, 1905, and is located between Alberta to the west and Manitoba to the east in Canada (Census, 2016). Although, the Saskatchewan Ministry of Environment has the constituted authorities to legislate, regulate, and enforce waste management laws (EMPA, 2010). However, among the legislated policies are the on-going stewardship programs and partial

EPR schemes on plastic waste. The researcher will discuss the process of implementing the stewardship programs and partial EPR on plastic bottles (see chapter 12) and how it has helped solve parts of the plastic waste problems in Saskatchewan.

9.4.3 Brief Alberta Profile at a Glance

The Canadian province of Alberta has a total population estimated at more than four million people in 2014 (Quarterly Population Report, First Quarter, 2014). The population density is about 5.7 persons per square kilometer and has an effect on the impact of waste generated and the collection services (Statistics Canada, 2014). Also, Alberta is bordered by the provinces of British Columbia to the west, Saskatchewan to the east (figure 30). Although, the province of Alberta has solved part of its plastic waste problems through the implementation of stewardship programs. The stewardship program legislation is still on-going and has helped to target high recovery rates of plastic bottles and reduction in littering as well as pollution. Therefore, the researcher will discuss the process of implementing the stewardship programs on plastic bottles (see chapter 12) and how it has helped solved parts of the plastic waste problems in Alberta.

9.4.4 Brief British Columbia Profile at a Glance

The Canadian province of British Columbia has a total population estimated at more than 4.8 million people as of 2017 (Environmental reporting BC, 2018). Victoria is the capital and Vancouver one of the largest metropolitan cities in British Columbia. The province is highly developed just like Alberta and Saskatchewan with increasing economic growth, urbanization, and industrialization. BC is also among one of the provinces that are leading to sustainable environmental practices (Environmental reporting BC, 2018). The province has implemented effective and efficient waste management procedures and solutions contributing to sustainability pathways. Hence, among these effective waste management procedures and solutions are the on-going extended producer responsibility (EPR) programs. The EPR programs were a progressive trend from the previously existing stewardship programs in BC. Latterly, the researcher will discuss the process of implementing the EPR programs on plastic bottles (see chapter 12), which have solved parts of the plastic waste problems in British Columbia.



Figure 30: Map of Saskatchewan (SK), Alberta (AB), British Columbia (BC) in Canada

Source: <https://hazmatmag.com>

9.4.5 Brief Rwanda Profile at a Glance

Rwanda is a country in the central region of Africa covering roughly 25,000 square kilometers of land with a population estimated at 9 million people in the year 2006 (UNDP, 2008). However, the context of the political, social, and economic system in Rwanda is profoundly linked with the civil war and genocide of the early 1990s (UNDP, 2008). Rwanda has undergone some major economic transformations in urbanization and industrialization, which are fast developing (UNDP, 2008). Thus, this rapid transformation is set to be the fastest specifically in the city of Kigali. On the other hand, the questions of the sustainable waste management system are still undermined as Rwanda's rural communities are confronted with the challenge of increasing waste. Although, Rwanda is among the African countries that have solved parts of its plastic waste problems through the implementation of a strict ban on plastic bags. Hence, the researcher will discuss from literature reviews the implementation of the strict ban on plastic bags (see chapter 12) by the Rwanda government.

9.4.6 Brief Ireland Profile at a Glance

The Republic of Ireland has a population of more than 4 million people in 2016 (Census, 2016). However, Ireland is among one the developed countries in Europe with increasing economic growth, urbanization, and industrialization. Thence, waste management practices in Ireland have matured significantly to sustainability pathways. Hence, Ireland's waste management practices are driven by EU policy, legislation, and

implementation initiatives. Therefore, waste management policy, legislation, implementation, and enforcement are considered to be strengthened within the EU framework. Meanwhile, Ireland has solved parts of its plastic waste problems through the implementation of levies on plastic bags. Thus, as a result of rising in environmental problems concerned about the effect of plastic bags pollution in the 1990s, the process of implementing levies on plastic bags started. Subsequently, the researcher will discuss from literature reviews the implementation of levies on plastic bags by the Ireland government (see chapter 12) which is of significance to this research.

CHAPTER TEN: RESEARCH METHODOLOGY

10.0 Introduction

This chapter describes the research methodology and framework. This research adopted the three types of descriptive research methods which are case study, observation, and surveying method to analyze various environmental policies used in Canada and Germany. While data collection on this research framework involves a qualitative approach through primary and secondary sources.

10.1 Site Selection

The study was carried out in Lagos State as social research. Meanwhile, Lagos State has the highest concentration of industrialization, urbanization, and the highest rate of waste generation in Nigeria. The state also operates open dumpsites with high numbers of scavengers scouting for recyclable materials from the dumpsites. For this study, the Lagos state was selected as the case study area based on access to that relevant information as discussed in chapter 9.

10.2 Research Methodology

The research adopted the case study method to analyze various environmental policies used in managing plastic waste in Germany and Canada. Thus, according to scholars, researchers can select any methodology that will determine the whole outcome of any research. According to Yin (1994) a case study research is used to investigate a contemporary phenomenon within its real-life context. The case studies help to understand the complexity of issues or objects and can extend experiences or add strength in complementary to existing research. It also involves the process of analyzing contextual details of events or conditions as they unfolded. Hence, the case study method was suitable for this research as it explains the complexity of the problem through existing experiences.

10.3 Data Framework

To achieve the associated aim of this research, the qualitative approach was used with a focus on data obtained through primary sources (Bryman, 2004). Besides, secondary sources of data were also adopted to minimize interference of errors in this research. The

researcher can also create an atmosphere of encouragement to obtain objective answers from the respondents.

10.4 Research Framework

The research framework includes primary and secondary sources of data collection through a qualitative approach.

(A) Primary sources involve data collection through the conduct of expert and non-expert interviews, administration of questionnaires, audio recording tape, field observations, and surveys that helps this research work.

(B) Secondary sources involve literature review on publications, articles, internet sources, reports on plastic waste management. Meanwhile, the literature review on this research framework undertakes various phases of the studies, which include the current state of the environment, contextual framework, and formulation, assessment of case studies, and reports on plastic management from investigated countries.

10.4.1 Choice of Stakeholders

The choice of stakeholders interviewed in this research is described in chapter 6 in Box 0.1 and 0.2. All those stakeholders were interviewed accordingly to correlate their responses to the reality of the situation.

10.4.2 Stakeholders Interviews

Interviews of all stakeholders were done using the qualitative approach to gather a deeper understanding of this research work. According to the findings of Berg (2009) and Bryman (2004), interviews provide the chance to gather robust information from respondents on the subject matter arising. The interviews have helped to gather more information on the research to formulate some meaningful discussions.

10.4.3 Field Observation and Survey

Observation and surveying during research serve the purpose of gathering a deeper understanding of some particular findings. Thus, field observation and surveying are ways of data collection. The researcher was able to examine the natural occurrence to correlate the information provided by respondents during the interview. Also, some pictures were taken by the researcher to present the reality of the current situation through vital images. Consequently, the researcher was able to experience social

happening to support the finding of this research. Hence, Bryman (2004) reveals that observation and surveying during research are useful to achieve some correlations between stakeholder's descriptions and the reality of those situations. Meanwhile, the preliminary field observation and surveying involve scouting through the study area to assess more information to make meaningful conclusions on this research. The observation was done in the context of the following assessment as shown in box 0.5.

- ✓ Communal waste collector activities
- ✓ Local Scavengers (waste-pickers) activities
- ✓ Local Dump Sites and International Landfill.
- ✓ Household activities on the sorting of recyclable materials
- ✓ Local and international private and government recycling plants
- ✓ Local and international recycling collection points

Box 0.5 Observation Contextual Assessment

10.4.4 Study Plans

The study took place in Lagos State, Germany, and Canada as social research. The research investigates the plastic waste problems in Lagos state concerning environmental degradation. The research also investigates environmental policy instruments in the context of Extended Producers' Responsibility (EPR) and Products Stewardship (PS). The research also discusses from literature review the implementation of a strict ban and enforcement on plastic bags in Rwanda and the regulation of plastic bags through levies in Ireland. Meanwhile, the research adopted the three types of descriptive research which involve the case study, observation, and surveying methods. While data collection on this research framework involves qualitative approaches through primary and secondary sources. Additional field observation and surveying were done by the researcher to correlate the finding with some meaningful reality. Finally, the research will give some recommendations which will improve plastic waste management in Lagos State.

10.4.5 Data Evaluation

For this research, the data evaluation was done through a qualitative approach and case study research. Furthermore, the data evaluation has helped to propose some scientific recommendations that will address the current problem of plastic waste pollution in Lagos State.

CHAPTER ELEVEN: INTERPRETATION I

11.0 Introduction

This chapter presents the interpretations from questionnaires as they were gathered through oral interviews and the application of questionnaires as administered to the policymakers and other stakeholders involved in this social research.

11.1 Interpretations from the Questionnaires

Considering integrating sustainable strategies for waste plastic collection and management in Lagos state, the interpretations were extensively done as follows.

11.2 Questionnaire Interpretations (QI)

A total of 6 questions were interpreted based on oral interviews. Meanwhile, the interpretations of these questionnaires were represented as questionnaire Interpretation (QI) (See Appendix1 for Questionnaire sample).

11.2.1 QI. 1: Do you think there are challenges of plastic waste pollution in Lagos state?

The results gathered from the respondents during the interviews indicate that they know about the existing plastic waste pollution in Lagos state which keeps increasing without proper regulations. Although, during an interview with the head of directors of Cleaner Lagos Initiative (CLI), also the serving Special Adviser to the Governor of Lagos State, Engr. Mr. Adebola Shabi explained different initiatives made by the Lagos state government to reduce the amount of waste generated daily. Among those initiatives is the environmental advocacy program which focuses on communities' waste reduction within their local areas. Mr. Adebola Shabi added that the purpose of this environmental advocacy program is to educate residents on the proper waste management systems in Lagos State. Furthermore, he said that this advocacy program involves regular interactions with communities and markets on how to reduce waste by engaging in reuse and recovery pathways. In the same manner, other respondents agreed that the environmental advocacy program has been successful on the part of communication, but has not targeted directly the reduction of plastic waste in Lagos State. However, this statement from the respondents supports the finding and observation of the researcher where plastic waste broadly litters the Lagos environment (see chapter 12). In this regard, the researcher will suggest intensive environmental advocacy and public awareness programs (chapter 14) to awaken the environmental consciousness of Lagos residents.

11.2.2 Q1. 2: What are the policies or laws to address these challenges?

The responses from the interviewed stakeholders agreed that various policies and laws have been put in place by the Lagos state ministry of the environment through relevant institutions. Among those institutions is the Lagos State Environmental Protection Agency (LASEPA) with the functional duty of maintaining, protecting, regulating, and enforcing environmental compliance in Lagos state. Hence, this is by the environmental objective of the Federal Republic of Nigeria, constituted under Section II, Number 20 which says “the state shall protect, improve the environment, safeguard the water, air, and land as well as forest and wildlife of Nigeria” (See Appendix 2). Based on these objectives, the Lagos State Environmental Protection Agency was established to protect, manage, and improving the Lagos environment. In a similar development, the environmental law of Lagos gives the constitutional authority under Cap. L. 23, Laws of Lagos State, 2004, to LASEPA the ability to enforce environmental compliance in Lagos state. Hence, these laws further give the agency the power under “section 19 sub-section, (1)”, to regulate and control pollution of any kind, “section 20 sub-section (1)” prohibits the discharge of any substances into the environment and “section 21 sub-section (1), (2)”, ability to issue and revoke permits if not complying to the conditions at which the permit was issued while, “section 22” prohibit any person or group to dump or bury or cause or allow to be buried or dumped any harmful materials in or over any land or water within the state been solid or liquid, or toxic, hazardous or radioactive substance (see Appendix 3). Below are the quotes of those laws as it was represented in the Environmental Law of Lagos State (final draft copy) under Part II of Integrated Pollution Control “Interpretation”.

In line with these constituted laws, LASEPA has already published its e-waste management policy (final draft) for Lagos state. The policy of the e-waste management law under the section of rights and responsibilities 3.3.5, sub-section 3.3.5.1 to 3.3.5.7 clearly addresses the responsibilities of producers with the necessary help from the ministry of environment in Lagos state to achieve the aim of environmental sustainability (see appendix 4). In whatever way, the researcher can suggest that these laws were only drafted for e-waste management in the Lagos state without considering the plastic waste in the environment. Thence, the researcher can also suggest that LASEPA who has the functional obligation to enforce environmental compliance in Lagos state has neglected its own responsibility in tackling the increasing plastic waste in Lagos State. On the other

hand, the e-waste management laws introduced by LASEPA could serve as an existing platform to tackle the challenges of increasing plastic waste in Lagos state if it will be further revised.

“Power to Make Regulation”

19 (1) “Without prejudice to the powers conferred on the Commissioner of the Environment

under the Lagos State Environmental Protection Agency Law, Cap. L23, 2004, the enforcing authority shall, after careful investigation, prescribe by regulations any description of the process as a process or establish standards, objectives, or requirements in relation to particular prescribed processes or particular substances for the purpose of carrying into effect the provisions of this Law”.

“Prohibition of discharge of substances, etc. into the environment”

20 (1) “No person shall, except under a permit granted by the enforcing authority and in accordance with the conditions attached to the permit, carry on a prescribed process or activities or discharge any substances into the environment after the commencement of this Law other than as determined for that process by or under Regulation made pursuant to section 19(1) above”.

“Application for permit” section 21 sub-section (1), (2) and section 22.

21 (1). “An application for a permit shall be made to the enforcing authority in accordance with the procedure prescribed under Regulations made pursuant to section 19(1) above”.

(2). “An application shall not be granted unless the enforcing authority considers that the applicant will be able to carry on the process so as to comply with the conditions which would be included in the permit. Dumping and Burying of Toxic or Radioactive, Medical Waste and

Harmful Wastes”.

21 “As from the commencement of this Law no person or group of persons shall dispose of, dump or bury or cause or allow to be buried or dumped in or over any land or water within the State any solid or liquid, or toxic, hazardous or radioactive substance or harmful waste as may be designated as such without the express participation of the enforcing authority and in accordance with the regulation or guideline of the enforcing authority”.

(See Appendix 3).

11.2.3 QI. 3: Have you heard about the corporate social responsibility (CRS) and extended producer responsibility (EPR) concepts

The researcher asked the interviewed respondents to give their definitions to determine their knowledge of these terms. It was observed that the respondents were not able to give profound definitions of these terms. For example, some of the respondents gave

their understanding of ‘corporate social responsibility as the responsibility of any organization to work with the government or local communities in achieving sustainable common goals in the environment. On the other hand, they understood ‘extended producer responsibility as the responsibility of the producers to protect the environment in the aftermath of their productions. They gave examples of some on-going private initiatives organizations projects such as we-cyclers, recycle points, Greenhill recycling, and Simple Change Big Impact Challenge from Guaranty trust bank that has significantly impacted the environment positively. The researcher noted that all the respondents have no in-depth knowledge.

11.2.4 QI. 4: Can the government integrate the EPR and levies program as measures to minimize plastic pollution in Lagos state?

The interviewed stakeholders’ opinions revealed that the integration of the EPR and levies programs will help minimize plastic pollution in Lagos State. They also analyzed that adopting the EPR program especially on plastic bottles will hold the manufacturers responsible for the environmental cleaning up of plastic waste generated as a result of their productions. In the same way, the respondents suggested that levies will help to promote participatory environmental responsibility. The respondents advocate for the integration of fines or penalties as consequences for producers who intend to boycott those measures in Lagos state. The researcher finds out that the respondents suggested that the integration of those measures in managing plastic waste in Lagos state could be a success. The respondents also added that fines and penalties should serve as consequences for offenders. The researcher proposed the EPR and levies as strategies to manage plastic in Lagos State.

11.2.5 QI. 5: In your opinion do you think those policies will reduce plastic waste in Lagos state?

Most of the respondents’ answers were positive that those measures will help to minimize plastic pollution in Lagos State. The respondents also emphasized that some developed countries like Germany have applied those policies to achieve high rates in recovery, reuse, and recycling of plastics which have amounted to success. Hence, they strongly agreed in their opinion that adopting those policies could promote a high rate of recovery, reuse, and recycling of plastic waste in Lagos State. The researcher agreed with the opinions of the respondents that the integration of those policies will work with the impact of other significant factors as discussed in chapters 14 and 15 respectively.

11.2.6 Q1. 6: What other things do you think the government can do to reduce plastic waste in Lagos state?

The respondents suggested that measures to reduce plastic waste in the Lagos environment could be bans, levies, or taxes, as well as continuous or intensive environmental advocacy programs on waste separation and sorting systems. But not all the respondents agreed with the ban as a measure to reduce plastic waste. The reason for this is that some of the respondents are involved in the plastic business and they fear the financial implications. Another suggestion mentioned by the respondents is to recommend plastic communities collection points or centers, especially for plastic bottles to prevent littering and pollution. Hence, the researcher was able to observe that most of the respondents have some basic knowledge on waste management but lack the environmental consciousness towards sustainable plastic waste management as a result of their personal interest.

CHAPTER TWELVE: INTERPRETATION II

12.0 Introduction

This chapter discusses the investigations that were carried out in Germany and some selected provinces like Saskatchewan (SK), Alberta (AB), British Columbia (BC) in Canada. Meanwhile, Germany and Canada provinces were chosen to give some European and North American perspectives of plastic waste management systems in the context of EPR schemes. The chapter also discusses how the two categories of the EPR schemes were applied in Germany and Canada. Also, the selected Canadian provinces have different Stewardship schemes and full EPR policy. Also, the chapter explains from literature reviews the implementation of the strict ban and enforcement on plastic bags in Rwanda and the regulation of plastic bags through a levy in Ireland. Thus, part of the outcome of this chapter was used in formulating the proposed strategies.

12.1 Case Study and the Implementation of the EPR Scheme in Germany

This section describes the implementation of the EPR scheme in Germany. The implementation of the EPR scheme serves as an indication of how the German economy of plastics production was able to move away from a linear to reuse /recycling economy of managing plastic waste which is still on-going.

12.2 Germany Application of the EPR Scheme

The German waste management system's vast shared responsibilities were enacted and legislated at the national and then passed across to the regional and local levels. Although, the regional levels comprise 16 federal states and each of those states have their constituted authorities to legislate waste management policy that targets high values of environmental sustainability and sanitation. This also means that the regional/states level can legislate laws that are bounded on the local levels within their jurisdictions. Furthermore, the shortage of landfills capacities in Germany has also allowed the use of high immense volumes of technical technology sufficient for waste management within regions and federal states jurisdictions. Thus, this immense volume of technical technology could be attributed to Germany's system of waste to energy facilities and scientific sludge incineration plants. Hence, this high level of waste management systems was achieved with strict legislated policies and regulations. However, among the strict legislated policies and regulations are the EPR schemes. As reported by Nakajima and Vanderburg (2006) the EPR schemes were partially adopted in Germany on June 12,

1991, under the German Waste Act (Waste Avoidance of Packaging, Recycling and Disposal Ordinance Act 1986), as amended in September 1994. Actually, this “Ordinance act” was made as a mandatory requirement for certain producers and manufacturers in German plastics and packaging industries to either collectively or individually take back their end products packaging waste. More so, this “Ordinance act” also made Germany the first country to set up the necessary system required for the recovery and recycling of packaging waste which includes plastic waste (Nakajima and Vanderburg, 2006). Subsequently, it was suggested that the “Ordinance act” was set to formalize the waste hierarchy of management options (3Rs) in order to attain a waste-free environment. Thereupon, the “Ordinance act” was adopted, legislated, and implemented across all the federal states in Germany. More so, the adopted legislation and the implementation of the Ordinance act allow the collection of packaging waste and materials for re-use and recycling which was technically possible and economically reasonable (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2005a, p. 18). The “Ordinance act” also obliged the manufacturers or producers to separate and manage household waste streams with full compliance with the environmental cost of coverage, communication, and coordination. Despite this, some manufacturers and producers quickly recognized that it is impossible to take those responsibilities individually and they decided to form a joint responsibility under the “Ordinance act” as EPR schemes. The EPR schemes require an “advance disposal fee” as tax or levy to be put forward by the producers before supplying products into the environment. Hence, EPR schemes were running as PRO programs which allows certain producers and manufacturers under one umbrella to manage their products' end-life cycle in compliance with the “Ordinance act”. The PRO programs were then extended and up running at different states level in Germany. The PRO programs also form a private sector initiative of Germany waste management system organized by the coming together of certain producers and manufacturers. Meanwhile, the producers or manufacturers under the PRO programs are obligated to pay a licensing fee per year. This amount depends on the type of plastic and packaging waste and the amount in tons generated by the individual company whose interest is to join the PRO programs. Additionally, under the PRO programs, plastic and packaging waste are easily traceable to specific producers or manufacturers who produce them. Then, as the PRO programs continue to expand across the German federal states and local levels, the capacity to manage the increasing plastic and packaging waste decreased. This situation led to

a round table discussion of all stakeholders under the German waste management policy and some resolutions were made (OECD, 1998, p. 13). Expediently, these resolutions were acted upon as the creation of the Dual System Deutschland (DSD) system came into existence. The DSD system was specially formed to manage the plastic and packaging waste beyond targeting high collection rates to the point of recycling and converting into secondary raw materials and other products forms (see figure 31).



Figure 31: Dual System Deutschland (DSD) for Plastic Waste Management in Germany

Source: www.gabot.de



Figures 32 and 33: Dual System Deutschland (DSD) and Green Dot Symbol logo for the Collection of Packaging Plastic Waste Management in Germany

Source: <https://www.dw.com>, www.greenpak.com.mt

Figures 32 and 33 indicate the Duals System Deutschland (DSD) system and Green Dot symbol logo on packaging plastic items signifying that it is to be recovered for recycling by the DSD system and thereby funded by the PRO program as previously discussed. Also, the Green Dot is the financing symbol for the organization of recovery, sorting, and recycling of sales packaging. Additionally, the Green Dot on the packaging indicates that such packaging is qualified for a national packaging recovery organization system. The DSD system is interwoven with the deposit refund schemes, which makes it easy for the recovery of plastic bottles. In the year 2003, the deposit refund scheme in Germany was introduced on glass, plastics, metals or composite materials. The deposit refund system on plastic bottles is a system where consumers buy certain packaged products in plastic and then pay a small amount of money which will be reimbursed back to the consumer when the plastic empty container is returned at the supermarkets or nearby location booths. More so, the deposit return reverses vending machine (collection machine) is placed inside different supermarkets or at nearby location booths where consumers can easily return their plastic empty container for reimbursement. Hence, most of the purchased plastic bottles have the Pfand logo indicating the amount to be deposited and returned as a reimbursement fee to consumers who buy certain packaged products in plastic bottles. Furthermore, the consumers get their deposit refund fee after scanning the Pfand logo from the plastic bottles placed inside the collection machine (see figures 34 and 35).



Figures 34 and 35: Pfand logo on Plastic Bottles and a Collection Machine in Germany

Source: Researcher input

Then, the collection machine will display a printable receipt for the total value of the recyclable plastic bottles after crushing and compressing them. Thence, the collection machine is also used for collecting other recycled beverage containers made of metal and glass as they can be easily transformed into secondary raw materials. Also, on each plastic bottle, the refund of the deposit fees usually ranges from €0.10 to €0.50, depending on the type and volume of the container. This deposit refund system is an application of product stewardship, where people are economically incentivized to recycle rather than waste. Generally, the aim of integrating the deposit-refund system is to target high rates of recovery, reuse, and recycling. Therefore, the researcher can assume that the established PRO program within the DSD and the deposit refund system have helped sustain the re-use and recycling economy to some extent. Similarly, the researcher can also presume that the yearly increase in DSD charges has a direct influence on the choice of plastic and packaging raw materials used by the producers and manufacturers. Thus, this implies that various producers, manufacturers, and consumers are changing behavior to protect the environment due to the established PRO programs as the key element of the EPR scheme. In this respect, the research has clearly described the implementation of the EPR scheme in Germany on plastic bottles. Hence, policymakers can adopt the outcome of this research in Lagos state, to maintain sustainable plastic waste management in Nigeria.

12.3 Case Study and the Implementation of the EPR Scheme in Canada

Waste management in Canada is clearly a provincial jurisdiction responsibility, except for hazardous waste, which is managed through federal (national) authority. Hence, provincial governments in Canada are equivalent to different states in Germany and Nigeria. Although, the provinces are made up of 10 Canadian provinces with 3 territories (see chapter 9) and each of these provinces has the constitutional authority to regulate and legislate waste management laws within their jurisdiction. At the same time, the Canadian national interests on waste management are represented by the Canadian Council for the Ministers of Environment (CCME), an intergovernmental forum for collective action on environmental issues across all the provinces. Furthermore, CCME plays some important roles in facilitating national environmental laws to maintain environmental sustainability and consistency across all provincial jurisdictions. In 2009 the CCME decided to promote consistency in waste management by proposing the adoption of EPR policy through the Canada-wide Action Plan (CAP) across all the

provinces (CCME, 2009). CCME through CAP planned to increase waste diversion, recovery, and recycling of waste by coordinating provincial EPR policy. At the same time, provincial EPR programs entrenched the principles of the Canadian waste management system to target all recyclable materials including empty or discarded beverage containers. Although it was not a consensus agreement by the CCME to adopt the EPR policy across all the provinces with immediate effect, the EPR policy represents the future trend for on-going stewardship programs operating in different provinces in Canada. Thence, the stewardship programs are established with the aims of recovery of recyclable materials. Thus, the stewardship programs were legislated across provincial levels with different frameworks in Canada. Meanwhile, the researcher observed that all stewardship programs across provincial levels in Canada require the producers to take environmental responsibility for the end life of their products either through partial or full funding. Hence, this implies that stewardship programs in Canada are either financed directly or indirectly by the provincial government, producers /or consumers. Thus, the researcher observed that the investigated provinces across Canada utilize stewardship programs for the collections of recyclable materials. Subsequently, it was gathered from the respondents during the audio interviews that stewardship programs are in the process of adjustment change over the years to achieve EPR policy across Canada. For this reason, it was investigated that multi-stakeholders in Saskatchewan and Alberta are still putting forward different proposals on how to adopt EPR legislation on plastic waste which is still on-going. Hence, this process of adjustment change is a way to improve the current recovery and recycling capacity of recyclable materials. More so, it was ascertained that the stewardship programs have helped to recover high rates of returned empty plastic bottles as investigated in provinces like Saskatchewan and Alberta. Although, the Alberta stewardship financial responsibility is provided by the consumers. While the Saskatchewan stewardship programs are funded under collective joint responsibility together with producers and the provincial government. Yet, the question of shifting the full financial obligation to the producers is still unresolved in some provinces like Saskatchewan and Alberta. Nonetheless, Saskatchewan and Alberta are still heading towards fully EPR policy legislation on beverage containers. Progressively, British Columbia remains the only province that has successfully implemented EPR for the management of plastic waste. The implementation of EPR in BC has obligated the shifting in the full financial responsibility of managing end-life cycles of discarded or returned all plastic packaging including plastic bottles to individual producers. Also, the

implementation of the EPR legislation in BC has recorded tremendous success with increasing environmental and social benefits. In this light, the researcher will briefly discuss the result from the three investigated Canadian provinces.

12.3.1 Saskatchewan (SK) Province Scenario

The Saskatchewan Ministry of Environment has the constituted authorities to legislate, regulate, and enforce waste management laws through province-wide legislation Environmental Management and Protection Act, 2010 (EMPA, 2010) according to (SSWM, 2017). However, the province of Saskatchewan tries to solve parts of its plastic waste problems through the application of stewardship programs and partial EPR which is still on-going. As the Saskatchewan provincial government consistently re-states its full commitment to adopt the EPR legislation for recyclable materials. Thence, the EPR legislation towards plastic bottles has not been fully actualized. Thus, the investigation by the researcher reveals that stewardship programs in Saskatchewan are used in the recovery of household packaging and paper including plastic beverage containers. Similarly, the researcher observed that the Saskatchewan stewardship programs support the concept of waste diversion. Furthermore, as reported in CCME (2014) the stewardship programs for household packaging and paper were legislated and adopted by Saskatchewan provincial government in the year 2000, as later amended in the year 2016. Meanwhile, the researcher's investigation revealed that the stewardship programs are jointly funded by the Saskatchewan provincial government and producers. As gathered from CCME (2014) the Saskatchewan stewardship programs are jointly funded together with the provincial government and the producers. Hence, the researcher assumes that the prudence of these funds has helped to sustain the stewardship programs to a certain extend. Furthermore, Saskatchewan stewardship programs require a deposit refund scheme in which consumers buy certain packaged products in a plastic bottle and then pay a small amount of money which will be reimbursed back to the consumers when the plastic empty beverage container is returned. Thus, this stewardship program in Saskatchewan province is more similar to the German plastic beverage container recycling systems. But the only difference is that the German consumers get their deposit refund fee after scanning the Pfand logo from the plastic bottles placed inside the collection machine (deposit return reverses vending machine) While, the SARCAN Recycling company Saskatchewan serves as an agency in contract with the provincial government and producers to manage the beverage containers recycling system.

Similarly, the SARCAN Recycling company is responsible for paying back refunds or deposit fees placed on returned recyclable materials including plastic beverage containers accordingly. Thence, the Saskatchewan provincial government is responsible for regulating refunds or deposit fees placed on each plastic beverage container at the sales points which is similar to the Alberta beverage container recycling system. Also, the refund or deposit fees on each plastic beverage container usually depend on the type and volume of the container. Consequently, consumers are accustomed to returning or drop-off their beverage containers at any SARCAN established designated drop-off centers across Saskatchewan. Meanwhile, the consumers receive their deposit refund instantly or through PayPal or by cheque at any convenient SARCAN drop-off centers. SARCAN has established various drop-off centers across Saskatchewan, with one administrative office and two other material processing facilities. SARCAN operates all drop-off centers in Saskatchewan with operational staff who are responsible for accepting, sorting, compressing, and baling together all returned recyclable items including plastic bottles (see figures 36, 37 and 38).





Figures 36, 37 and 38: SARCAN Operate and Sorted Processing System

Source: Research input

Figures 36, 37, and 38 indicate how Saskatchewan stewardship programs are being managed to target the high rate of plastic beverage container recovery. The full financial responsibilities of managing empty plastic bottles in Saskatchewan could be directed to the producers. However, this can only be achieved if the EPR policy is legislated and adopted at Saskatchewan provincial level. For this reason, the legislation of the EPR policy in Saskatchewan will enable sustainable management of any plastic bottles and plastic beverage containers and a move to the circular economy of plastics production.

12.3.2 Alberta (AB), Province Scenario

Alberta provincial department responsible for waste and recyclable material management is called Alberta Environment and Parks (AEP). Although, the province of Alberta tries to solve part of its plastic waste problems through the application of stewardship programs across the province. Hence, the stewardship program legislation is still on-going and has helped to target high recovery rates and reduction in plastic beverage

container littering as well as pollution. Meanwhile, recyclable materials recovered through stewardship programs are managed through Delegated Administrative Organizations (DAO's). According to the EPR report card (2014), DAO's are arms' length of the Alberta provincial government, governed by representatives from multi-stakeholders including producers. Thence, the DAOs continue to support the Alberta stewardship programs for the recovery of recyclable materials. Furthermore, Alberta Beverage Container Recycling Corporation (ABCRC) is the operational agency responsible for the collection, transportation, and processing of beverage containers in Alberta. ABCRC was incorporated in compliance with the Beverage Containers Recycling Regulation as managed according to the Beverage Container Management Board (BCMB) in Alberta (www.abcrc.com). Hence, the Alberta Beverage Container Recycling Corporation (ABCRC) has the functional obligation to establish different designated deposit/return drop off centers for recovering recyclable beverage containers across the province. More so, all the designated return/depot centers in Alberta have an operating staff with the functional responsibility of accepting, sorting, and processing recyclable materials including plastic beverage containers (see figure 37, 38 and 39).





Figures 39, 40 and 41: ABCRC Operate and Sorted Processing System

Source: Research input

The Alberta provincial government and ABCRC set the Container Recycling Fee and they also regulate the refunds or deposit fees placed on each beverage container at the sales points. Subsequently, the deposit fee on each beverage container is passed on by the retailers (www.albertadepot.ca). Thus, some retailers have chosen to pass the deposit fees on each plastic beverage container directly to the consumers at sales points. However, these deposits placed on each plastic beverage container are refunded at any designated return/depot centers. Also, the deposits vary depending on the size of the plastic beverage containers returned. Meanwhile, the consumers receive their deposit refunds instantly or through PayPal or by cheque at any convenient return/depot centers which is also similar to the Saskatchewan beverage containers recycling system. Yet, the deposits still serve their main purpose of preventing plastic littering, pollution, and environmental degradation as environmental benefits. While the social-economic benefit is seen as a large number of citizens drop off different kinds of recyclable materials at designated depot centers and their refund fees are collected. In the above figure, Alberta stewardship programs are been managed to target the high rate of plastic beverage container recovery. Hence, the Alberta stewardship financial responsibility is provided by the consumers which have sustained the stewardship programs as observed by the researcher. Therefore, the researcher assumed that the province of Alberta has demonstrated leadership in stewardship programs by influencing the recovery systems of recyclable materials

including plastic beverage containers. Similarly, the researcher also gathered from respondents that various proposals to adopt the EPR policy are still been reviewed in Alberta. Thence, the researcher is convinced that the Alberta stewardship programs can progressively transit to EPR legislation in managing plastic bottles. Ultimately, adopting the EPR policy into legislation will help to promote the circular economy of plastics production.

12.3.3 British Columbia (BC) Province Scenario

The BC environment has the constitutional authority to legislate, regulate and make policies that are bounded on the local levels within their jurisdictions. Among this legislated policy is the on-going extended producer responsibility (EPR) programs that capture high rate of beverage containers including plastic bottles. However, the implementation of EPR programs for packaging and paper products (PPP) has solved parts of BC plastic waste problems in which the producers have both operational and financial responsibility. Thus, this implementation of EPR legislation in BC was a progressive trend from the existing stewardship programs. It was gathered from the respondents during the audio interviews that the stewardship programs were the initial starting point that formed the present EPR programs in BC. Furthermore, the respondents also revealed that the BC stewardship programs were first launched along with the deposit system in 1971 to address environmental issues associated with beverage containers including plastics. Also, the stewardship programs compelled all producers of beverage containers across BC to establish return/deposit designated centers within the province. Hence, the aims of establishing return/deposit designated centers across BC were to target waste diversion and recovery of recyclable materials. Similarly, the stewardship programs in BC only targeted 85% (percent) of the recovery of beverage containers (www.recyclebc.ca).

Nonetheless, the stewardship programs in BC have not captured all-recyclable recovered materials. As a result of this, the BC Ministry of the environment in the year 2003 decided to review the stewardship programs to mandate the producers to cover the full financial responsibility management of the recyclable materials. Hence, by the year 2004, the reviewed stewardship programs were legislated and amended as the Recycling Regulation of the Environmental Management Act (B.C. Reg. 449/2004). Furthermore, this regulation obligated the producers to take full responsibility for improving the recycling capacity of beverage containers (www.recyclebc.ca).

The regulations also require all producers to draw up stewardship plans and then submit the plans to the Ministry of Environment for approval (www.recyclebc.ca). Consequently, the respondents reveal that there was an improvement in the recycling of beverage container materials especially plastic bottles according to the new stewardship plans adopted in BC. Also, the researcher noticed that various respondents didn't mention that all plastic bottles were recycled completely. As the CCME in the year 2009 announced plans to coordinate provincial full EPR programs, BC provinces decided to transition progressively from its stewardship programs to EPR policy legislation. Meanwhile, this transition led to the legislation of EPR programs in BC in May 2014. Progressively, the legislation of EPR programs in BC enables producers to take up full responsibility for recyclable plastics materials including plastic bottles. The EPR programs in BC shifted the full responsibility of managing plastic bottles to the producers. Also, the EPR programs support the waste hierarchy guideline and encourage producers to design recyclable and durable plastics and packaging materials that will be of environmental benefit. This implies that their new design materials can be reused, recycled, and recovered over time before losing their end life cycle. The EPR programs in BC entailed high efficiency and effectiveness in collection and recycling capacities, especially on plastic beverage containers. Therefore, the researcher presumed that the EPR programs in BC support the plastic circular economy of plastics production. The researcher also observed that EPR programs in BC have expanded beyond plastic and packaging materials which have improved the economy, the standard of living, and the environment. Essentially, the EPR programs in BC serve as an inspiration to other provinces in Canada.

12.4 Implementation of Ban on Plastic Bags in Rwanda

Rwanda is undergoing a major economic transformation as urbanization and industrialization are fast developing. Thus, this rapid transformation is set to be the fastest specifically in the city of Kigali (see more in chapter 9 of study areas). On the other hand, the questions of the sustainable waste management system are still undermined as Rwanda's rural communities are confronted with the challenge of waste. Although, Rwanda is the only African country that has solved parts of its plastic waste problems through the implementation of the strict ban on plastic bags across the country. Hence, the researcher can assume that the then-existing situation of plastics pollution in Rwanda is comparable to the present situation in Lagos State. Similarly, the researcher

could also presume that the then-existing plastic waste problems reflect the improper disposal habits and lack of environmental education of Rwandan citizens resulting in environmental degradation. More so, it has also been revealed by the Rwandan Ministry of Environment, that plastic bags are associated with environmental pollution such as contamination of water bodies and killing of aquatic animals, etc. (Pritish, 2019). As a result of those provocative environmental situations, the Rwandan Ministry of environment decided in 2003, to initiate a national discussion to deal with the use of plastic bags across the country. However, the discussion was to implement a ban on the manufacturing, production, and importation of plastic bags, as well as the pronouncement of a one-year penalty, fines, or imprisonment for the offenders. Also, the discussion to implement a strict ban on plastic bags was extended across all communities in Rwanda. Moreover, this discussion supports the strategy of vision 2020 for a sustainable environment (RWANDA VISION 2020). However, by the year 2004, the discussions were drafted, adopted as legislation, and pronounced to be implemented in the following year. Subsequently, by the year 2005, the Rwanda government announced the implementation of the ban on production/manufacturing, importation, exportation, and the use of plastics less than 100 microns thick (Pritish, 2019). The implementation of those policies was accomplished with education and awareness campaigns that promote the use of alternatives such as bio-degradable plastic to all citizens. Although, those policies were affecting the activities of Rwandans plastic bag manufacturers/producers. Nonetheless, the Rwanda government decided to intervene by proposing recycling facilities to the manufactures/producers instead of manufacturing or producing more plastic bags (UNEP, 2018). Consequently, the Rwanda government noticed that the policy was not so effective and efficient enough as various consistency lapses were identified. One of the identified gaps in this consistency is the smuggling of plastic bags in and out of Rwanda and also from neighboring countries (UNEP, 2018). By the year 2008, the Rwanda Ministry of environment decided to review the existing policy with additional clauses of regulation. Those clauses of regulation include a strict ban on plastic bags and the provision of alternative paper and cotton bags across the country (UNEP, 2018). Additionally, these clauses also include the willingness of the Rwandan government to support investment in plastic recycling facilities, enforcement of prohibited laws, strict border control, and close monitoring of possible importation and exportation of plastic bags (UNEP, 2018). Hence, the reports from UNEP (2018) reveals that various stakeholders have criticized the action of the government, saying that there

was no proper consultation before implementing the new clause of regulations on plastic bags which has affected specifically the poorest citizens of the country. Contradictory to this report, Pritish (2019) claims that the government officials argued that the strict ban on plastic bags has helped to develop the recycling facilities for polythene bags (plastic bags). Also, Pritish (2019) reported, that the government officials claimed that the impacts of bans have helped to regulate plastic bag littering and pollution that may have arisen from continuous uses by Rwanda citizens overtimes. Hence, it was also revealed that the Rwandan citizens have adapted the new regulation (UNEP, 2018), and the reward was seen as Kigali is named one of Africa's cities of the future (UN habitat, 2012). Eventually, the researcher presumed that Rwanda's success in achieving the implementation of a strict ban on plastic bags is an inspiration for other Africa countries like Nigeria. Therefore, the implementation of the ban on plastic bags in Nigeria is easy, but the essential conditions such as legislation, enforcement, monitoring, border control, awareness campaigns, and provision of alternative paper and cotton bags must be fulfilled. Hence, the cost of implementing such a strict ban on plastic bags together with the above-mentioned essential conditions are challenges in Nigeria. Nevertheless, the researcher can suggest that it is possible to implement a strict ban on plastic bags with the presence of the above-mentioned essential conditions in Lagos state.

12.5 Implementation of Levy on Plastic Bags in Ireland

Waste management policy in Ireland includes ranking options of waste hierarchy according to the EU policy. Ireland's waste management practices, which include policies, legislation, implementation, and regulation have significantly improved the environment over the years. Ireland has solved part of its plastic waste problems through the implementation of a levy on plastic bags. The process of implementing levies on plastic bags started in the 1990s as there was an uprising in environmental problems and the effect of plastic bag pollution in Ireland. During this time, it has been reported that plastic bags constituted about 5% of the national litter composition in Ireland (Litter monitoring body, 2003). Thus, the uprising in the environmental problem of plastic bags pollution leads to constituting a stakeholders committee by the Ireland Minister of the environment to propose sustainable solutions that will minimize the use of plastic bags (Mauro Anastasio and James Nix, 2016). Hence, the stakeholders' committee decided to conduct open consultations on the use of possible market base instruments to regulate plastic bags against littering and pollution across Ireland. Then, the concluding outcome

of the open consultations was to adopt a levy as a market base instrument for regulating plastic bags. Consequently, by the year 1998, the stakeholders' committee submitted their recommendations report to impose a levy on each plastic bag at all sales points across the country. This recommendation was also designed for behavior changing and to awaken the environmental consciousness of its citizens. Then, between the year 1999 and early 2002, the Ireland Ministry of environment decided to ratify the recommendations report and proposed (€) 0.15 Euro levy on each plastic bag provided to consumers/shoppers at the point of sale (Mauro Anastasio and James Nix, 2016). Meanwhile, exemptions were given to plastic bags that are no bigger than 225mm in width, 345mm in-depth, and 450mm in length (Mauro Anastasio and James Nix, 2016). Also, these exempted plastic bags are mainly used for wrapping food in industries for hygiene and safety purposes (Mauro Anastasio and James Nix, 2016). Examples of exempted plastic bags are used for wrapping fish, meat, vegetables, dairy products, and cooked food (Mauro Anastasio and James Nix, 2016). The proposed levy will also serve as revenue for the national environmental fund, which was enormously agreed upon by all stakeholders (Mauro Anastasio and James Nix, 2016). Subsequently, in March 2002, the implementation of levies on plastic bags and the establishment of national environmental funds was adopted into legislation in Ireland (Mauro Anastasio and James Nix, 2016). As a result of this legislation, it was recorded that there was a decrease in plastic bags littering tremendously (Mauro Anastasio and James Nix, 2016) (see Figure 42).

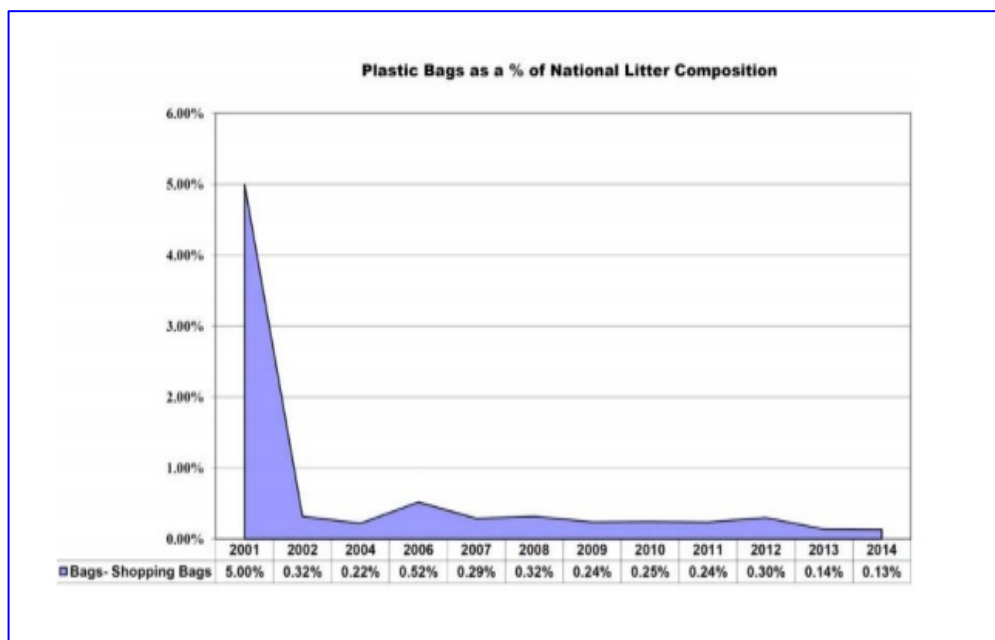


Figure 42: Decrease in Plastic Bags Littering from the Years 2002 to 2014 in Ireland
 Source: Anastasio and Nix (2016)

Year	Levy Rate (€)	Plastic Bag levy (€m)
2002	0.15	10.4
2003	0.15	12.9
2004	0.15	15.3
2005	0.15	17.5
2006	0.15	19.9
2007	0.15/0.22 from 1 July	22.6
2008	0.22	26.7
2009	0.22	23.5
2010	0.22	17.5
2011	0.22	15.7
2012 estimate (Cash Basis)	0.22	14.2
2013 estimate (to 30 June 2013)	0.22	7.2
Total		203.4

Table 2: Shows the Levy Rate and the Plastic Bag Levy (National Environmental Fund) from the Years 2002 to 2014.

Source: Anastasio and Nix (2016)

From the above figure, the researcher could suggest that there was a reflection in the behavior change of the citizens as they complied with the levy fee. Simultaneously, the researcher can also assume that the increase in the plastic bag levy (national environmental fund) was a result of compliance. The table above also shows that there was an increase in levy rate from (€) 0.15 to (€) 0.22 in the year 2007 accordingly due to the rising in the use of plastic bags from 21 to 31 in 2006 per capita (Anastasio and Nix, 2016). Also, as reported by Mauro Anastasio and James Nix (2016) the government decided to increase the levy rate during those periods to phase out the total use of plastic bags in the country. Nevertheless, the researcher observed from the figure, that there was a gradual decrease in the plastic bag levy (national environmental fund) from 2009-2011. At the same time, the responsibility of enforcing this levy lies with the local authorities, who make sure that the levy is remitted to the national environmental fund accordingly. Thus, the researcher can suggest that the imposed levy on plastic bags in Ireland has helped in reducing littering and pollution. Hence, the researcher also presumed that the national environmental fund was initiated to support all environmental development projects across Ireland. Similarly, the researcher can also say that impact of the levy has strengthened the behavioral change and awaken the environmental consciousness of the

citizens. Therefore, he can also develop a similar framework of levy on plastic bags with indigenous knowledge to solve part of the issue of its plastic waste problems in Lagos State.

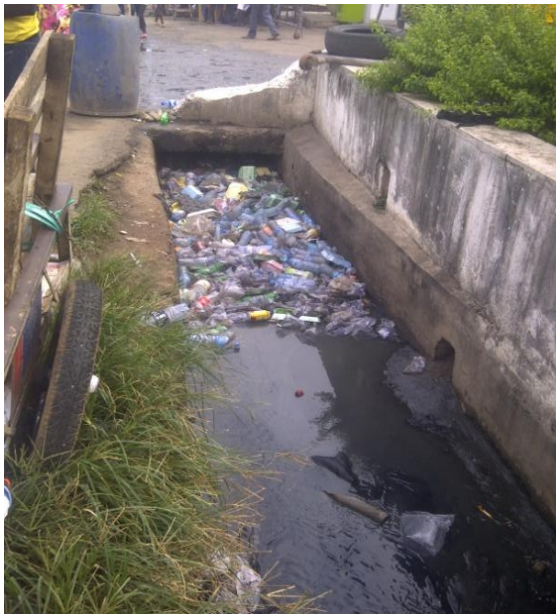
CHAPTER THIRTEEN: FINDINGS

13.0 Introduction

This section discusses the findings according to the researcher field observation and surveying which was represented with some pictures. Also, the researcher was able to interpret the problems of plastics pollution in the Lagos state according to the waste hierarchy guideline.

13.1 Findings from the Field Observation and Survey

The researcher was able to observe and survey different kinds of plastics pollution such as empty bottles, bags, and sachets water waste. This is attesting to the everyday habit of the residents where plastic waste is dumped or thrown in various areas of the environment in Lagos State. Also, the researcher observed that the littered plastic waste finally ends up blocking the drainage, clogging the wastewater channels, and polluting the waterways because of the physical environmental conditions in Lagos state (see figures 43-46).





Figures 43,44, 45 and 46: Different Kinds of Plastics Pollution

Source: Research input

Thus, there should have also been intensive environmental education and development of public awareness in consideration of the daily habits of plastic waste littering by the residents in Lagos state. Besides, the environmental problem of plastic waste can also be related to some constraining factors such as policies, institutional and infrastructural failures, etc. Then, all those constraining factors should have been the top priority in policy-making to achieve sustainable plastic waste management in Lagos state. The researcher also observed how the scavengers (waste pickers) pick up sorted-out plastic bottles on dumpsites (see figures 47-49).



Figures 47, 48 and 49: Plastics Sorted Out on Dumpsite

Source: Research input

Lastly, the researcher also observed that there is no current research that focuses on the integration of sustainable collection and management of plastic waste in Lagos State. Therefore, this research will focus on sustainable strategies for the management of plastic waste in Lagos State.

13.2 Findings on the Effect of Plastics Pollution in Lagos State According to the Global Waste Hierarchy Guideline

The researcher reviewed the waste hierarchy guideline to establish some pieces of evidence on how to manage plastic waste in Lagos State. Moreover, the principles of the waste hierarchy support sustainable development through the ranking of waste management options according to what is environmentally friendly (see chapter 5). Hence, figure 13 gives top priority to preventing waste in the first place when waste is created, it gives priority to preparing it for re-use, then recycling, then recovery, and last is disposal. Consequently, the researcher observed that the management of plastic waste relating to the waste hierarchy guideline is been turned upside-down in Lagos state. This is represented by figure 50 according to observations and surveys.

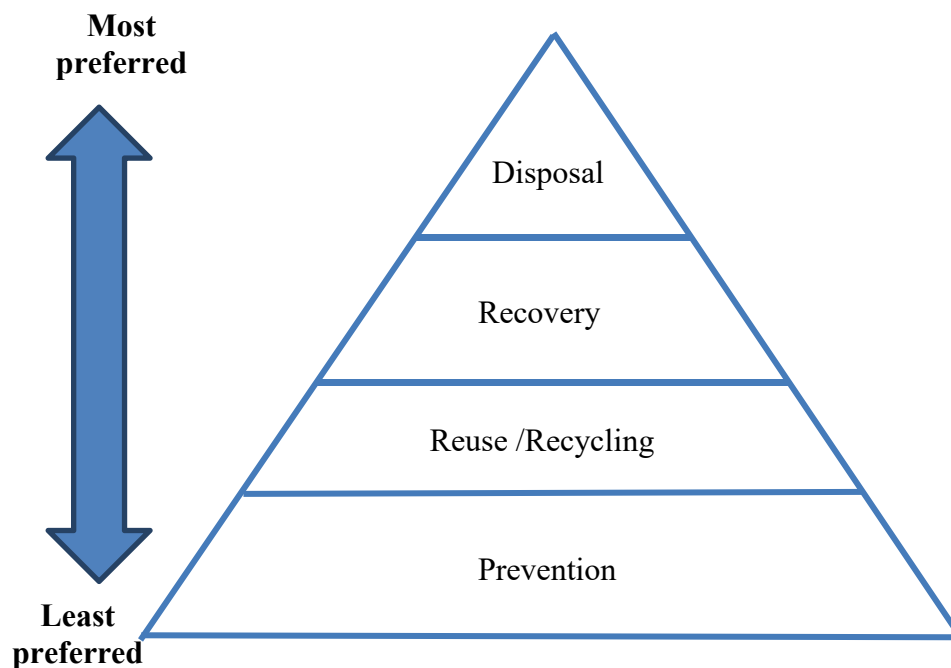


Figure 50: Plastic Waste Relating to the Waste Hierarchy Guideline is Been Turned Upside-Down in Lagos State.

Source: Research input

Figure 50 illustrates the plastic waste management practice in Lagos state and accordingly gives priority to disposal as the most common followed by recovery and recycling, then reuse, and finally prevention. Then, it was clear evidence that the recommended principles of the waste hierarchy have failed in Lagos State. It is also undeniable that the failure in implementing these principles has led to failure in achieving sustainable plastic waste management in Lagos state. Therefore, this could be traced to the accumulation of plastic waste which has resulted in plastic pollution in the Lagos environment. However, to achieve sustainable plastic waste management in Lagos state, there is a need to properly integrate the global waste hierarchy options in waste management policies. Therefore, this will help to target the collection and management system of plastic waste through recovery, recycling, and reuse. Thence, this research will propose some useful strategies that will prioritize the aim of recovery, recycling, and reuse of plastic waste in Lagos State.

CHAPTER FOURTEEN: PARAMETERS TO THE STRATEGY

14.0 Introduction

In this chapter, the researcher can identify significant parameters necessary for sustainable plastic waste management in Lagos state. Those parameters are relevant for the proposed strategies and its associated components as illustrated in figure 51.

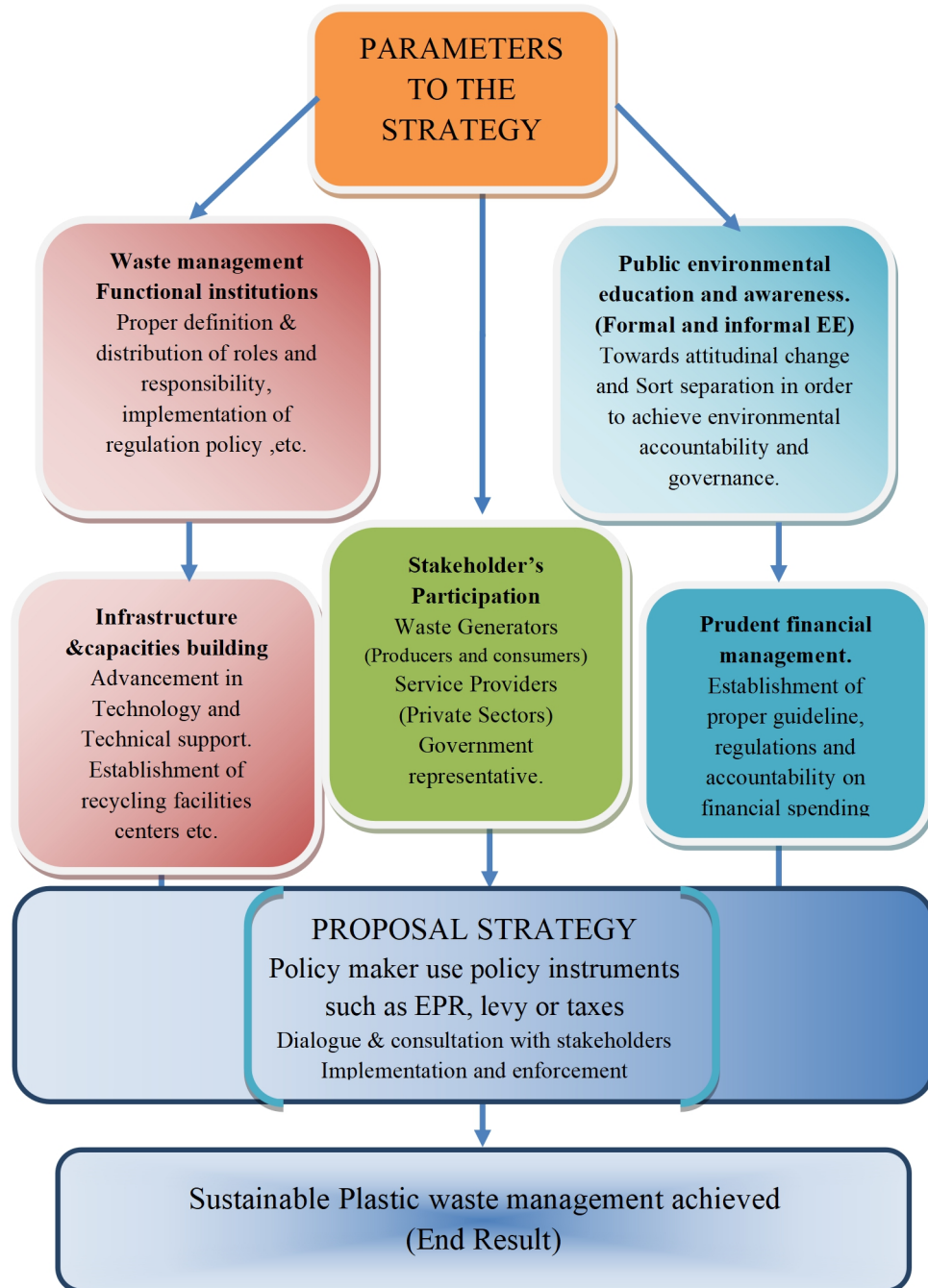


Figure 51: Parameters Necessary for Sustainable Plastic Waste Management in Lagos State.

Source: Research input

14.1 Waste Management Functional Institutions

The creation of waste management functional institutions with the appropriate distribution of responsibilities will determine the sustainable management system of plastic waste in Lagos State. Apparently, it is a necessity for the policymakers to focus their attention on institutional restructuring to achieve a functional waste management system in Lagos State. The designated institutions should step up to their responsibilities to enforce or implement those policies at various levels in the societies. At the same time, these policies should align with the principle of waste hierarchy options that will prioritize the aim of recovery, recycling, and reuse of plastic waste in Lagos State. Also, those policies should also be incorporated with the use of EPR and levies to create incentives to prevent plastic pollution. Conclusively, the creation of functional institutions will enhance the opportunities to achieve sustainable plastic waste management in Lagos State.

14.2 Infrastructure and Capacity Building

To achieve sustainable plastic waste management in Lagos state, there is a need to improve the infrastructure and capacity such as increasing the number of waste collection trucks, technical supports, and the establishment of functional recycling facilities and stations. More so, the capacity building could also be done by replacing human support with functional technology resources to enhance the plastic waste collection system and recycling facilities. Moreover, infrastructure and capacity building is a way to reduce the volume of waste and to save a high number of recyclable items before ending up in the waste stream. Thus, one key way to reduce plastic littering in Lagos state is to constitute an appropriate infrastructure capacity that will cope with the increasing volume of plastic waste in the environment.

14.3 Intensive Public Environmental Education and Awareness

Intensive environmental education and public awareness are steps to achieve sustainable plastic waste management. Environmental knowledge is necessary to achieve participatory environmental responsibilities and behavior change. According to the researcher's assumption, the participation of communities in environmental decision-making processes will create positive environmental impacts in society. Despite this assumption, it is necessary to understand the importance of environmental education and public awareness as a step to achieve a sustainable environment. Regardless of this, the integration of environmental education in schools' curricula is a necessity to create

environmental awareness, knowledge, and attitude. Meanwhile, the integration of environmental education formally in schools can be offered in primary and secondary levels with new content curricula of a sustainable environment. Similarly, the non-formal education systems will take the forms of training, advocacy, and public awareness in communities, local and national levels. Hence, this follows the researcher's assumption that sustainable waste management requires community and public participation to attain its success. Then, the researcher can suggest that intensive environmental education and public awareness are necessary to tackle the present and future plastics pollution in Lagos State.

14.4 Prudent Financial Management

Financial prudence is a part to achieve sustainable plastic waste management in Lagos state. To avoid mismanagement, the spending of funds must follow guidelines, regulations, and accountability. In several developing countries, the waste management system is underfunded due to corruption and mismanagement of funds. Hence, there is a need to spend funds on the appropriate running cost of the waste management system and other environmental damages accidents that may arise from the waste management sector. However, the effective and efficient use of these funds with proper accountability on the financial statements will enhance sustainable functional plastic waste management in Lagos State. Despite this, the management of waste should be a collective effort of all stakeholders in achieving sustainable environments. Ultimately, the researcher agreed that financial prudence is a way to achieve sustainable plastic waste management in Lagos state.

CHAPTER FIFTEEN: THE PROPOSED EXTENDED PRODUCER

RESPONSIBILITY AND LEVY AS STRATEGIES

15.0 Introduction

This chapter proposes EPR and levy as strategies policy instruments that will help to minimize the increasing amount of plastic waste in Lagos State. Also, the two proposed EPR strategies and their components can only be effective with the set of supported parameters. More so, the two EPR strategies adopt “deposit fee” in order to target high collection and recycling rates of plastic (drinking) bottles and sachets water waste. Likewise, the levy was proposed to minimize the use of plastic bags. On the other hand, EPR and levy are proposed to tackle plastic waste in the context of plastic bottles, bags, and sachets water waste in Lagos State. Hence, the strategies are divided into three paths as follows.

15.1 STRATEGY I: EPR with Deposit-Refund Scheme on Plastic Drinking Bottles Waste Returned to Stores.

The researcher proposes the EPR with a deposit-refund scheme for the collection of plastic beverage drinking bottle waste as strategy 1. In this strategy, the producers take full responsibility for the management of plastic bottle waste. Further to this proposed scheme, the producers can put forward all financial and operational capacity to collect empty plastic bottle waste through a deposit refund scheme. In this case, the producers can set up a consumer “deposit fee” to the initial amount on a certain plastic bottle that will be refunded upon returning the empty discarded plastic bottle. Thence, this means that the deposit fee must be valuable enough to achieve high collection rates to reduce the consumers activities of plastic bottle waste littering and pollution in Lagos State. However, this kind of proposed system is similar to the deposit-refund scheme currently set up by some multinational corporations in Nigeria which includes Coca-Cola company and Nigeria Breweries Plc. These two multinationals have set up a collection system for the return of their empty bottles in partnership with their current own distributors. Hence, this collection system takes place after supplying their distributors with needed consumable full bottles of coke or beer, then they transport the collected empty bottles back to their station. Moreover, this is obviously more sustainable rather than going back empty with their trucks. Therefore, this is a similar existing platform but not totally the

same in which the EPR deposit-refund scheme can be easily introduced on plastic beverage drinking bottle waste as it is represented in figure 52 and 53.

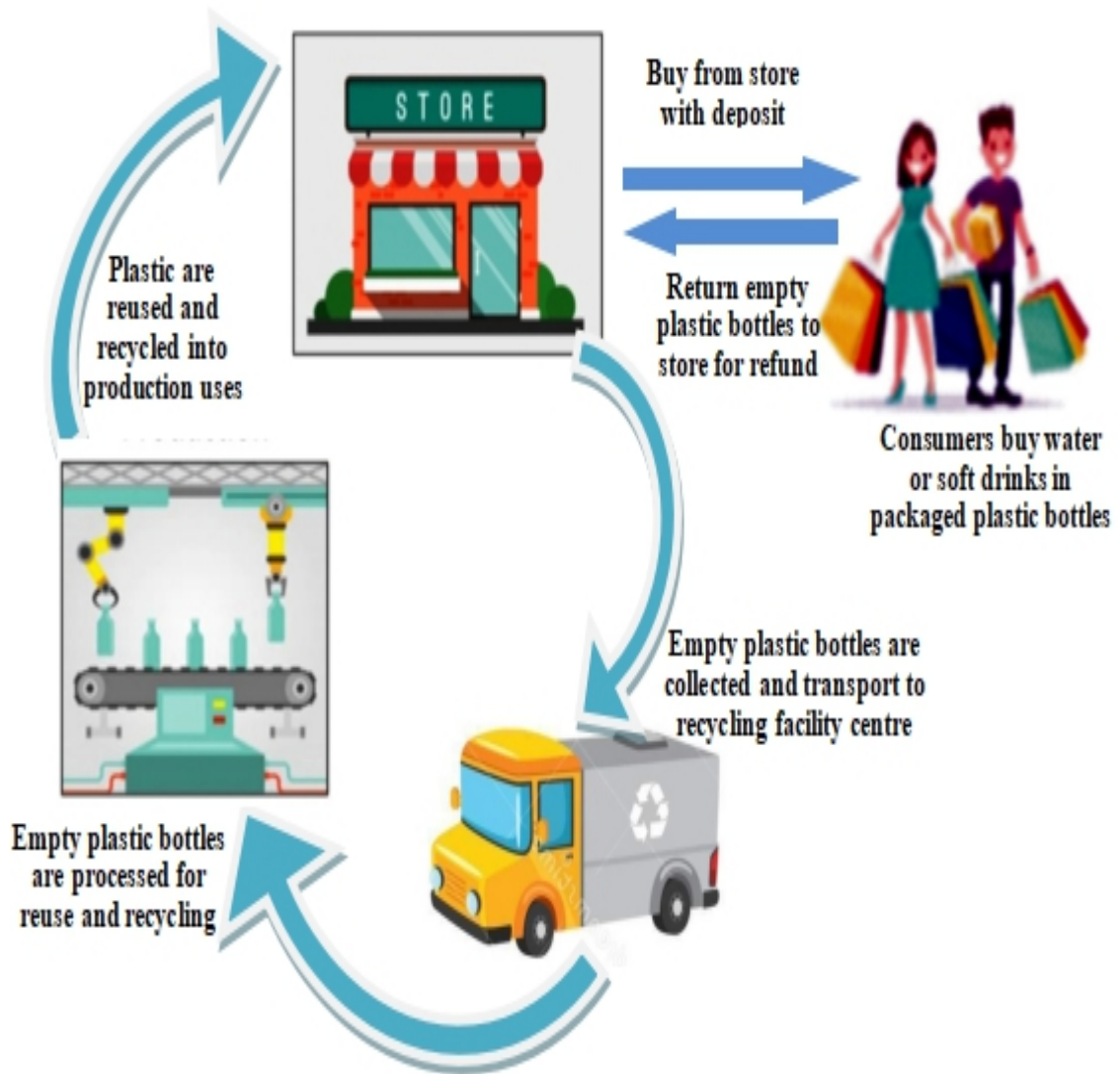


Figure 52: EPR with Deposit-Refund Scheme on Plastic (Drinking) Bottles Waste

Source: Research input

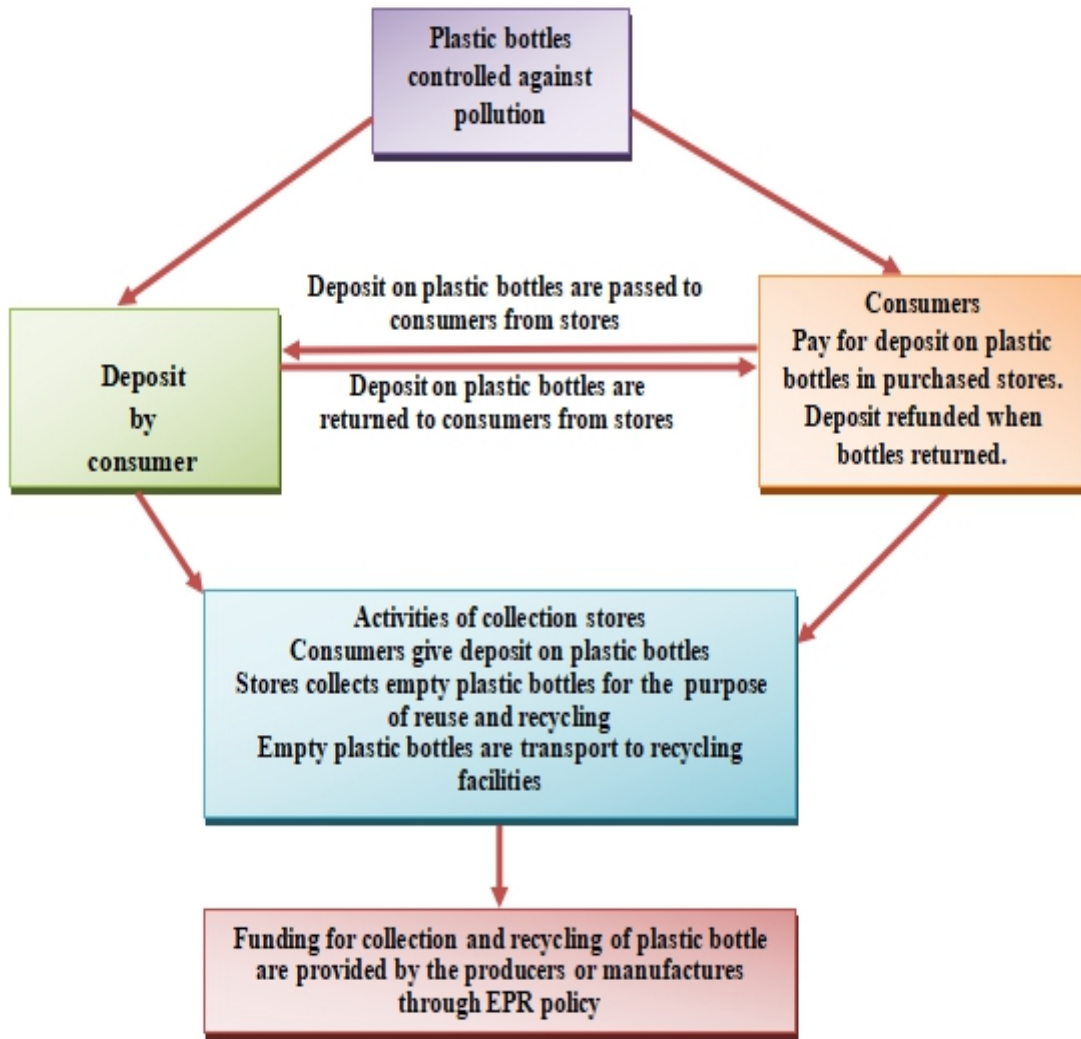


Figure 53: Plastic Bottles Controlled against Pollution through EPR Policy

Source: Research input

This proposed scheme of the deposit-refund system could be introduced and adopted to reduce plastic bottle waste littering the Lagos environment. At the same time, the transportation and recycling facilities of plastic bottles could be contracted through bidding, co-owned or city municipal-owned depending on the structure of arrangement with the producers during consultations. In-addition investigated country like Germany uses the scheme with successes. Extensively, adopting this strategy will probably end plastic bottle littering and pollution in a short and long period of time in Lagos State.

15.2 STRATEGY II: EPR on Plastic Drinking Bottles and Sachets Water Waste with Designated Return Depot Centers

The researcher proposes the EPR with designated return depot centers for plastic (drinking) bottles and sachets water waste. In this strategy II, the producers can put forward all financial responsibility for managing plastic (drinking) bottles and sachets water waste. Besides, this will help to avoid littering of plastic waste such as bottles and sachet water waste in the environment. Similar, to the previous strategy the producers can also set up a consumer “deposit fee” to the initial amount on a certain plastic bottle and sachets water waste that will be refunded once the empty plastic bottle and sachets water are returned at the designated return depot centers. This also means that the deposit fee must be valuable enough to achieve high collection rates to reduce the consumers activities of plastic bottle waste littering and pollution in Lagos State. Also, the transportation and recycling facilities could be contracted through bidding, co-owned or city municipal-owned depending on the structure of arrangement with the producers during consultations. This type of proposed scheme will help to reduce plastic waste pollution in the environment as it is introduced and represented in figures 54 and 55.



Figure 54: EPR on Plastic (drinking) Bottles and Sachets Water Waste with Designated Return Depot Centers

Source: Research input

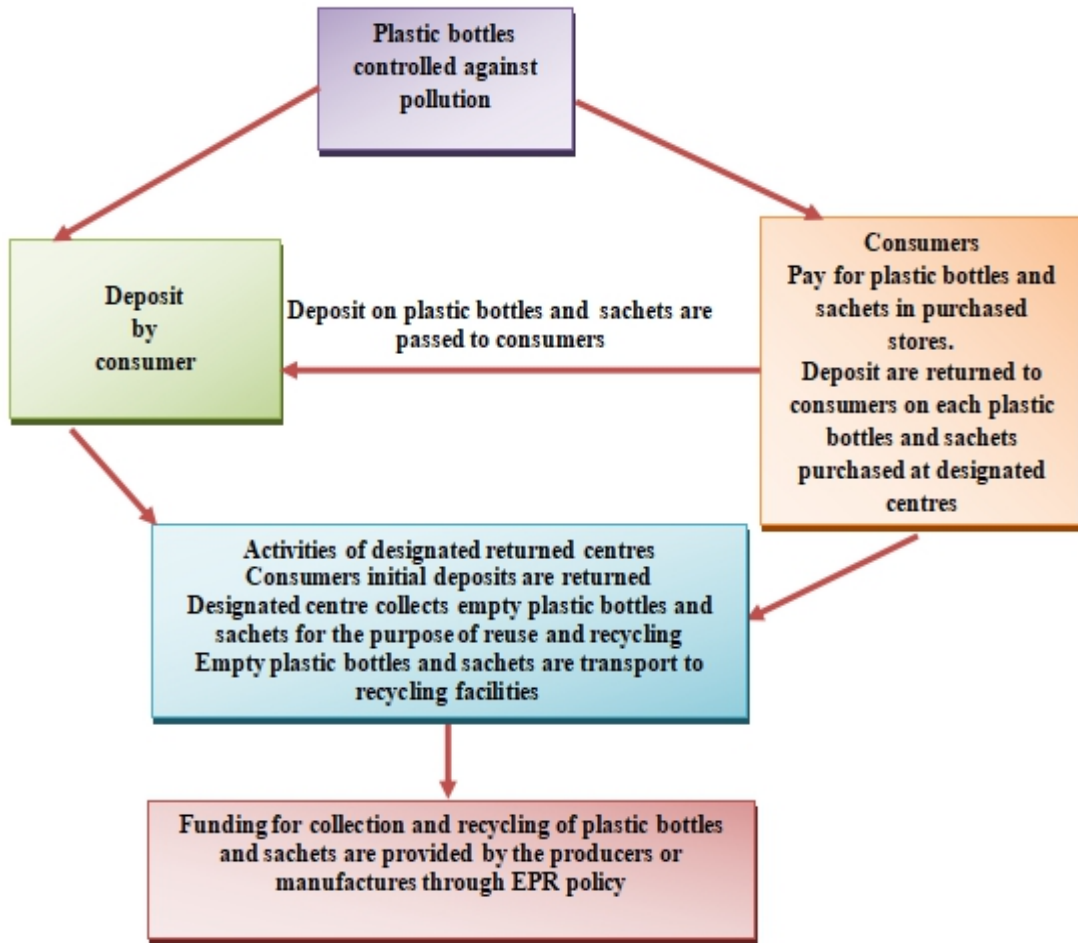


Figure 55: Plastic Bottles and Sachets Controlled against Pollution through EPR Policy

Source: Research input

Furthermore, EPR on plastic bottles and sachets water could be practiced in Lagos state where designated return depot centers are assigned close to the consumer's convenience. Absolutely, this strategy is proposed to target the aim of recovery, recycling, and reuse of plastic in Lagos State.

15.3 STRATEGY III: Levy on Plastic Bags

Strategy III proposes the use of levy as a regulatory instrument in reducing the number of plastic bags littering in the environment. As discussed in section 12.5 Ireland has implemented the use of levy as a regulatory instrument on plastic bags with achievement. Thus, the use of a levy can encourage the residents to appraise the use of reusable alternative bags. This is intended to reduce consumer's expectations of free plastic shopping bags after buying products in shops and shopping centers. Similarly, this will

provoke the consumers' attitude temporarily to either buy the taxed plastic bags or reusable alternative bags at first. Likewise, this may also awaken the environmental consciousness of the consumers' daily habits of plastic bag littering which contribute to plastics pollution. Hence, the benchmark of the levy could be determined through environmental economic or valuation using the trial and error method to achieve the precise amount of reduction in plastic littering in the environment. Ultimately, this proposed strategy will revitalize the behavioral change in consumers' habits to appraise the use of eco-friendly reusable alternative bags as a replacement. Also, the levy will generate an environmental fund that will be put to use in various environmental developmental projects with the establishment of regulated spending guidelines.

15.4 Components of the Strategies

This section discusses the components of the strategies that will enable sustainable plastic waste management if implemented in Lagos State.

15.4.1 Amendment on Existing Legislation

To implement the proposed strategies in Lagos state waste management, there is a need to adopt the use of EPR policies and levy act into the existing environmental law of Lagos state. These regulatory instruments could be adopted after proper consultations and dialogues with relevant stakeholders. Meanwhile, the LASEPA has the functional responsibility to enforce environmental compliance in Lagos state (see section 11.2.2 QI. 2). Also, the draft copy of the e-waste management law which includes the use of EPR policy by LASEPA (see section 11.2.2 QI. 2) has created some platform at which these proposed strategies can be implemented in achieving sustainable plastic waste management policies. In conclusion, all the proposed strategies can be implemented together with the discussed parameters and the components.

15.4.2 Integrating the Lagos State Recycling Board

To achieve sustainable plastic waste collection and management in Lagos state, there is a need to integrate a recycling board or agency that will be responsible for advising and coordinating the recovery, reuse, and recycling of materials like plastic across the state. Hence, this recycling board will serve as a part of a body working with LSWMA. Thus, this recycling board must be constituted in consultation and dialogue with relevant stakeholders in Lagos to facilitate recycling stations across all the local governments present in the state. Thus, these recycling stations must have the capacity to collect,

process, and recycle waste in a sound environmental manner. Also, the recycling stations must have the full operational capacity to process all categories of recyclable materials. Besides, it is necessary to create a recycling board that will stand up to the increasing waste in Lagos State. Hence, the creation of this recycling board will enable sustainable plastic waste management in Lagos State.

15.4.3 Privatization of Plastic Waste Collectors

To achieve sustainable plastic waste management in Lagos state, privatization is required. This will help to reduce the amount of pressure mounted on governmental institutions and infrastructure in the waste management sector. Privatization in this sector will allow interested private investors to invest in different areas in the waste sector, especially on plastic waste management in Lagos State. An example of this was observed by the researcher in Germany and Canada where private investors are involved in the recovery and management of different types of recyclables materials. In the same manner, privatizing the waste management sector in Lagos state is an advantage of private sector innovation to overcome the challenges of the increasing plastic waste. Hence, the growing population in Lagos state is a great opportunity to invest in the recycling plastic waste business.

15.4.4 Promote Reusable Bags

The use of reusable bags has gained more attention in recent times especially in a country like Ireland where there is a rise in the awareness level of its citizens on the use of reusable bags during shopping (see section 12.5). Moreover, Ireland has placed a high cost levy on plastic bags. Eventually, a country like Nigeria is still using single-use shopping bags in very large numbers contributing to the environmental problem of plastics pollution. Hence, this is attributed to the low environmental awareness level and the usage of free give away of plastic bags during shopping. Therefore, the researcher suggested the implementation of a levy on plastic bags (see section 15.3, STRATEGY III) and intensive formal and informal environmental education and awareness across (see section 14.3) across all the local governments in Lagos State.

CHAPTER SIXTEEN: CONCLUSION

The research aims to understand the possibility of introducing environmental policies that are needed to manage plastic waste in Nigeria. The three research questions are:

- i. What is the Present State of Plastic Pollution in Nigeria?
- ii. What are the Environmental Impacts of Plastic Pollution in Lagos State?
- iii. What are the Recommended Environmental Policies needed to address Plastic Pollution in Lagos State?

The methods applied in the empirical part of this research are qualitative analysis, followed by the methodological framework of data collection through primary and secondary sources. The research also adopts the three main types of descriptive research methods, which are case- study, observation, and surveying methods. The research further analyzes the case study experiences from Germany and some investigated provinces like Saskatchewan, Alberta, British Columbia in Canada. Meanwhile, the observation and surveying methods present the actual situation as it will be represented with pictures and images. Also, the research discusses from literature reviews the implementation of the strict ban and enforcement on plastic bags in Rwanda and the regulation of plastic bags through levies in Ireland. Hence, the research work follows the pathways as social research resulting in discussion and extended to answer the three research questions.

i. What is the Present State of Plastic Pollution in Nigeria?

The continuous linear economy model of plastics production has resulted in plastics pollution in Nigeria. Also, plastics pollution in Nigeria is a result of discarded packaging plastic which includes bottles, bags, and sachets water. Hence, this could be correlated to the producers' negligence as their focus is only on maximizing profit according to their economic responsibilities. Although, the producers focusing on maximization profit is reasonable. Nonetheless, the negligence of the producers to control its plastic end product life cycle as waste has resulted in plastics pollution in Nigeria. Further to this, the researcher can presume that plastics production output will increase in Nigeria as the newly built largest petrochemical refinery known as Dangote refinery will commence its operation in the year 2021. Thus, this newly built largest petrochemical refinery in Nigeria will contribute to economic growth which is seen as a positive impact. But the negative impact will be seen as increasing plastics pollution in Nigeria. As a result of this,

the producers of packaged plastic bottles, and sachets water should be held accountable through the legal system framework of their establishment. Moreover, this is promulgated according to their legal responsibilities to fulfill notions of fair business operations in the environment. In- addition, it is ethical to embrace values, norms, standards in practices even if they are not complying with the legal system guideline. Thence, the researcher presumed that the four models of CSR components support sustainable development, regardless of the motivations and approaches. Contrary to this, the absence or weakness in regulating the activities of Nigerian producers of packaged bottled water and other items in plastics, has led to increasing plastics pollution in Nigeria. Hence the regulating agency in Lagos state that can enforce the penalties on producers is the Lagos state environmental protection Agency (LASEPA). Therefore, the researcher can presumably argue that the absence or weakness in roles and responsibilities has resulted in plastics pollution in Nigeria. Thereupon, policymakers need to introduce strict legislation, enforcement, and monitoring for environmental benefits.

ii. What are the Environmental Impacts of Plastic Pollution in Lagos State?

The environmental impacts of plastic waste due to the negligence from the producers, improper disposal habits reflecting the citizen's behavior, poor waste management due to weakening or failure policy have emanated to plastics pollution. More so, the finding of the research proves that the use of plastic for packaging drinking water generates more waste and it apparently reflects the improper disposal habits, poor water management, and lack of urban water supply for all Lagos residents which subsequently leads to plastic pollution. Thence, this supports the research findings that plastic waste litters the streets, clogging drainage systems, and polluting the waterways. Also, it supports the research findings that waste hierarchy guideline is being turned upside-down in Lagos state. Thus, giving priority to disposal as the most common, followed by recovery and recycling, then reuse, and finally prevention, accordingly. This further supports the argument of the researcher that the recommended principles of the waste hierarchy have failed in Lagos state leading to intensified environmental impacts of plastics pollution. Besides, those environmental impacts are a result of an absence of environmental awareness and failure to implement environmental policies among which were discussed as parts of the parameters to sustainable plastic waste management in Lagos State. Therefore, the environmental impacts of plastics waste can be avoided if the outcome of this research is adopted. Hence, the environmental impacts of plastic

waste have helped to understand different strategies that are needed to address plastic waste management in Nigeria according to the researcher.

iii. What are the Recommended Environmental Policies needed to address Plastic Pollution in Lagos State?

This research proposed environmental policies and approaches to manage plastic waste in Nigeria. Before-then, the research critically analyzed the effects of human activities leading to plastics pollution particularly in Lagos State. The research also evaluates different case studies of existing environmental policies used in Germany and some investigated provinces in Canada.

The research further discusses from literature reviews the implementation of the strict ban and enforcement of plastic bags in Rwanda and the regulation of plastic bags through levies in Ireland. Furthermore, the researcher proposed some parameters to support the strategies and their components. Pressingly, the researcher also proposed strategy I as EPR with Deposit-refund scheme on plastic (drinking) bottles waste, then strategy II as EPR on plastic (drinking) bottles and sachets water waste with designated return depot centers. More so, the two EPR strategies adopt “deposit fees” in order to target high collection and recycling rates of plastic (drinking) bottles and sachets water waste. Also, the researcher proposed strategy III as a levy on plastic bags. Meanwhile, the levy generated as an environmental fund will be put to use in various environmental developmental projects with the establishment of regulated spending guidelines.

Furthermore, the parameters are the condition that will support the strategies, the strategies are action plans designed to achieve the short and long-term goals, and the components to the strategies are elements that allow the strategies to resolve the plastic waste problems in Lagos State. The research may not reflect all the existing situations plastic waste problems in other states of Nigeria. But, by and large, the proposed parameters, strategies, and components can help resolve part of the plastic waste problems in Lagos State and would likely translate to other states in Nigeria. The Nigerian economy is among the fast-growing economy in Africa characterized by various environmental problems among which is plastics pollution. Hence, plastics pollution in Nigeria has affected the quality of the environment and is a threat to aquatic animals. Therefore, to achieve sustainable plastic waste management in Lagos State, there is a need to adopt parts of this research outcome with Nigeria's knowledge. As

difficult as this task may be, it will help target a high rate of plastic recovery, reuse, and recycling. It will also promote the reuse and recycling economy of plastics production in Lagos State, which is a pathway in achieving the circular economy.

REFERENCES

- A. Parkes, (1865). On the properties of Parkesine, and its Application to the Arts and Manufactures, *Journal of the Society of Arts*, 14, pp. 81, reprinted in: C.A. Russell, D.C. Goodman, 'Science and the rise of technology since 1800', Open University Press, 1972.
- Abila, B. & Kantola, J. (2013). Municipal Solid Waste Management Problems in Nigeria: Evolving Knowledge Management Solution. *World Academy of Science, Engineering and Technology International Journal of Environmental and Ecological Engineering* Vol. 7 (6), 2013.
- Adedeji, D & Eziyi O. I. (2010). Urban Environmental Problems in Nigeria: Implications for Sustainable Development. *Journal of Sustainable Development in Africa*. http://eprints.covenantuniversity.edu.ng/260/1/Paper_in_JSDA.pdf. (Volume 12, No. 1, 2010) ISSN: 1520-5509 Clarion University of Pennsylvania, Clarion, Pennsylvania. (accessed on 10.06.2019).
- Agbesola, Y.O. (2013). Sustainability of Municipal Solid Waste Management in Nigeria: A Case Study of Lagos. Retrieved from: <http://www.divaportal.org/smash/get/diva2:644961/FULLTEXT01.pdf>.
- Aiyedogbon, J. (2012). Poverty and youth Unemployment in Nigeria, 1987-2011: http://www.ijbssnet.com/journals/Vol_3_No_20_Special_Issue_October_2012/30.pdf. *International Journal of Business and Social Science* Vol. 3 No. 20 (Special Issue – October 2012).
- Annexure, H. (2005), national waste management strategy implementation south africa recycling extended producer responsibility status quo report: <http://sawic.environment.gov.za/documents/233.pdf>
- Athanasios V. (2018). Concept and Practice of the Circular Economy. Turning goods at the end of their service life into resources, closing loops in industrial ecosystems and minimizing waste.
- Aupperle, K. E. (1984). *An Empirical Measure of Corporate Social Orientation. Research in Corporate Social Policy and Performance*. Greenwich: JAI Press.
- Awomeso, J. A., A.M. Taiwo, A.M. Gbadebo & A.O. Arimoro (2010). Waste Disposal and Pollution Management in Urban Areas: A Workable Remedy for the Environment in Developing Countries. <https://thescipub.com/pdf/10.3844/ajessp.2010.26.32>.
- B.C. Reg. 449/2004 O.C. 995/2004. Environmental Management Act RECYCLING REGULATION [Last amended June 29, 2020 by B.C. Reg. 162/2020]: https://www.bclaws.ca/civix/document/id/complete/statreg/449_2004.
- Baekeland, L. H. (1909). The Synthesis, Constitution, and Uses of Bakelite, *Journal of Industrial and Engineering Chemistry*, March, p. 155, reprinted in: C.A. Russell, D.C. Goodman (eds), 1972, *Science and the rise of technology since 1800*, Bristol: The Open UP, pp. 222-228.
- Basiago, A. D. (1999) Economic, social, and environmental sustainability in development theory and urban planning practice. *Environmentalist* 19:145–161:<https://doi.org/10.1023/A:1006697118620>.
- Batagarawa, R.L. (2011). Sustainability Appraisal of Waste Management in Nigeria: Development and Evaluation of An Index Based Tool:

- https://researchportal.port.ac.uk/portal/files/5795165/THESISRabia_BATAG_ARAWA.pdf.
- Berg, B. L. (2009). *Qualitative Research Methods for the Social Sciences* (7th uppl.). Boston, Massachusetts: Allyn and Bacon.
- Bide, T. (2020). Report on the datasets available relating to social and environmental dimensions of extraction. Deliverable 1.3 of the ORAMA project: https://www.researchgate.net/publication/339796148_Report_on_the_datasets_available_relating_to_social_and_environmental_dimensions_of_extraction_Deliverable_13_of_the_ORAMA_project.
- Boyd, D. R. (2018). An Effective and Financially Self-sustaining Approach for Reducing the Discharge of Plastics to Oceans expert round table on oceans with g7 sherp as Pearson College, United World College, Victoria, British Columbia, Canada.
- Britannica Corporate Site (2001). Encyclopaedia Britannica New releases: http://corporate.britannica.com/press/releases/2001_dvd.html.
- Broschek, J. (2011). "Historical Institutionalism and the Varieties of Federalism in Germany and Canada." *Publius: The Journal of Federal-ism* 42 (4): 662–87.
- Bryman, A. (2004). *Social Research Methods*. Oxford: Oxford University.
- Carroll A. B. (1991). The pyramid of corporate social responsibility: toward the moral management of organizational stakeholders. *Business Horizons* July–August 34: 39–48.
- Carroll A. B. (1979). A three-dimensional conceptual model of corporate performance. *Academy of Management Journal* 4(4): 497–505.
- Carroll, A. B. & Buchholtz, A. K. (2011). *Business and society: Ethics and stakeholder management* (8 ed.). Australia: Thomson South-Western.
- Carroll, A. & Shabana, K. (2010). The business case for corporate social responsibility: A review of concepts, research and practice. *International Journal of Management Reviews*, 12(1), 85-105: <http://dx.doi.org/10.1111/j.1468-2370.2009.00275.x>.
- CCME (2009). Canada-wide action plan for extended producer responsibility Canadian Council of Ministers of the Environment October 2009: https://www.ccme.ca/files/current_priorities/waste/pn_1499_epr_cap_e.pdf.
- CCME (2014). State of Waste Management in Canada Prepared for: Canadian Council of Ministers of Environment. Canadian Council of Ministers of the Environment: https://www.ccme.ca/files/Resources/waste/wst_mgmt/State_Waste_Mgmt_in_Canada%20April%202015%20revised.pdf.
- Census (2016). Saskatchewan Population Report : https://pubsaskdev.blob.core.windows.net/pubsask-prod/100723/100723-Saskatchewan_Population_Report_for_the_2016_Census.pdf.
- Census (2016). Summary Part 1: <https://www.cso.ie/en/media/csoie/newsevents/documents/census2016summaryresultspart1/Census2016SummaryPart1.pdf>.
- Chunyan S. (2009). Recycling Economy and Ecological Economy <https://pdfs.semanticscholar.org/ac50/38c822f180b90378237c3a12209b2660229a.pdf>.
- Clapp J. & Swanston L. (2009). 'Doing away with plastic shopping bags: international patterns of norm emergence and policy implementation', *Environmental Politics*, 18 (3), 315- 332.

- De Schutter, O. (2008). Corporate social responsibility European style. *European Law Journal*, 14, 203-236:<http://dx.doi.org/10.1111/j.1468-0386.2007.00411.x>.
- Demographic Dividend - Lagos State Government (2015). The opportunity we must not forget:<https://mepb.lagosstate.gov.ng/wp-content/uploads/sites/29/2017/08/Demographic-Dividend-in-Lagos-State-2015-1.pdf>.
- Dung-Gwom J. Y. (2015). A New Environmental Agenda for Nigeria: Retrospect and Prospect Lead Paper Presented by Professor John Y. Dung-Gwom, Head of Department Urban and Regional Planning, University of Jos, Nigeria. On the occasion of the National Conference on the theme: Setting an Environmental Agenda for the New Dispensation in Nigeria. Federal Polytechnic Nasarawa, Nasarawa State, July 29 To 31, 2015. (accessed on 13.02.2017).
- Ebo Tawiah Quartey, Hero Tosefa, Kwasi Asare Baffour Danquah and Ilona Obsalova (2015). Theoretical Framework for Plastic Waste Management in Ghana through Extended Producer Responsibility: Case of Sachet Water Waste.
- Ellenmac Arthur foundation (2013). Towards the circular economy: <https://www.ellenmacarthurfoundation.org/rethink-the-future>. The New Plastics Economy: Rethinking the future of plastics Ellen MacArthur Foundation.
- Environmental reporting BC (2018). Trends in British Columbia's Population Size & Distribution:http://www.env.gov.bc.ca/soe/indicators/sustainability/print_ver/envreportbc_bc_population_March2018.pdf.
- EPR Report Card (2014). Extended Producer Responsibility (EPR) Report Card: <http://www.eprcanada.ca/reports/2014/2014-Extended-Producer-Responsibility-Report-Card-EN.pdf>.
- European Commission (2008). Environment, Directive 2008/98/EC on waste (Waste Framework Directive):<http://ec.europa.eu/environment/waste/framework/>.
- European parliament briefing (2014). Turning waste into a resource Moving towards a circular economy: [https://www.europarl.europa.eu/RegData/etudes/BRIE/2014/545704/EPRS_BRI\(2014\)545704_REV1_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2014/545704/EPRS_BRI(2014)545704_REV1_EN.pdf).
- Fadun, S. O. (2014). Corporate Social Responsibility (CSR) Practices and Stakeholders Expectations: The Nigerian Perspectives: <http://www.macrothink.org/journal/index.php/rbm/article/view/5500/4380>.
- Filho, W. L. & Kovaleva, M. (2015). Food Waste and Sustainable Food Waste Management in the Baltic Sea Region. <https://DOI:10.1007/978-3-319-10906-0>.
- Friedel, R. (1983). Pioneer Plastic. The making and selling of celluloid, Madison: University of Wisconsin Press.
- GESAMP (2016). Sources, Fate and Effects of Microplastics in the Marine Environment – Part Two of a Global Assessment. In: imo/fao/unescoioc/unido/wo/iaea/ununep/undp Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (ed. P. J. Kershaw & C. M. Rochman), 220.
- Geva, A. (2008). Three models of corporate social responsibility: Interrelationships between theory, research, and practice. *Business and Society Review*, 113(1), 1-41: <http://dx.doi.org/10.1111/j.1467-8594.2008.00311.x>.
- Geyer, J. R. & Jambeck, K.L. L. (2017). Production, use, and fate of all plastics ever made *Sci. Adv.*, 3 (7) (2017), Article e1700782, [10.1126/sciadv.1700782](https://doi.org/10.1126/sciadv.1700782)

- Gharfalkar M., Court R., Campbell C., Ali Z. & Hillier G. (2015). “Analysis of waste hierarchy in the European waste directive 2008/98/EC”, *Journal of waste Management, Volume 39, May 2015, Pages 305-313*, <https://doi.org/10.1016/j.wasman.2015.02.007>.
- Gillis, J. & L.H. Baekeland (1965). (oorspronkelijke documenten), verhandelingen van de Koninklijke Vlaamse Academie voor Wetenschappen. Letteren en Schone Kunsten van België, Klasse der Wetenschappen 27, Nr. 81.
- Giroux, L. & Bury, D. (2014). State of Waste Management in Canada. https://www.ccme.ca/files/Resources/waste/wst_mgmt/State_Waste_Mgmt_in_Canada%20April%202015%20revised.pdf.
- Gouldson A. & Sullivan R. (2012). Ecological modernization and the spaces for feasible action on climate change. In *Climate Change and the Crisis of Capitalism*. Pelling M., Manuel-Navarrete D. & Redclift M. (eds). Routledge: London; 114–126.
- Grankvist, P. (2012). *CSR in practice - How companies work with sustainability to make money*. (2nd ed.) Stockholm: Grankvist & Liber AB.
- Halliday, Stephen (1999). The Great Stink of London. Sir Joseph Bazalgette and the cleansing of the Victorian capital: <https://www.homepages.ucl.ac.uk/~ucessjb/Halliday%201999.pdf>.
- Haskell, D. (2004) What is Extended Producer Responsibility, Edited for distribution to the Zero Waste Network Wanganui: <http://www.grn.org>.
- Haynes, W. & L. H. Baekeland (1961). In: Eduard Farber, *Great Chemists*, New York: Interscience Publishers.
- Idowu, O., Omirin, M. & Osagie, J. (2011). Outsourcing for Sustainable Waste Disposal in Lagos Metropolis: Case study of Agege Local Government, Lagos. *Journal of Sustainable Development*, 4(6), 116-131.
- IEEP (2017). *EPR in the EU Plastics Strategy and the Circular Economy: A focus on plastic packaging*: <https://ieep.eu/uploads/articles/attachments/95369718-a733-473b-aa6b153c1341f581/EPR%20and%20plastics%20report%20final.pdf?v=63677462324>.
- IEEP (2018). *Moving towards a circular economy for plastics in the EU by 2030*: Emma Watkins (IEEP) and Jean-Pierre Schweitzer (IEEP).
- Iffat Zabin (2013). *An Investigation on Practicing Carroll’s Pyramid in Bangladesh*: <https://www.semanticscholar.org/paper/An-Investigation-on-Practicing-Carroll%E2%80%99s-Pyramid-inZabin/24d95ad78d540d5c6e60ee4fc9bd010f03b42413>.
- International Solid Waste Association (n.d.). *ISWA Key Issue Paper on Waste Prevention, Waste Minimization and Resource Management*: http://ec.europa.eu/environment/resource_efficiency/pdf/ISWA%20International%20Solid%20Waste%20Association.pdf.
- Jeremy K. O’Brien, P.E. (2008). “Waste-To-Energy and The Solid Waste Management Hierarchy”, *Proceedings of NAWTEC16, 16th Annual North American Waste-to-Energy Conference, May 19-21, 2008, Philadelphia, Pennsylvania, USA*: <http://www.seas.columbia.edu/earth/wtert/sofos/nawtec/abstract/nawtec16/nawtec16-1953.pdf>.

- Johan, H & Hervé, C. (2011). The European Waste Hierarchy: from the socio-materiality of waste to a politics of consumption: The waste hierarchy model: disassembling and reassembling the socio-materiality of waste.
- Kaffine, D. and O'Reilly, P. (2015) What Have We Learned About Extended Producer Responsibility in the Past Decade? A Survey of the Recent EPR Economic Literature. OECD.
- Karel M & Marjolijn K. (2014). How PVC plastic became Unplastic.
- Keijer, T., V. Bakke & J. C. Slootweg (2019). Circular chemistry to enable a circular economy.
- Kotler, P., & Lee, N. (2005). Corporate responsibility: Doing the most good for your company and your cause. Hoboken, New Jersey: Wiley.
- Kurucz, E., Colbert, B., & Wheeler, D. (2008). The business case for corporate social responsibility. In A. Crane, A. McWilliams, D. Matten, J. Moon & D. Siegel (Eds.), *The Oxford Handbook of Corporate Social Responsibility* (pp. 83-112). Oxford: Oxford University.
- Lagos Bureau of Statistics (2010). Lagos Welfare and Services Delivery Survey. Ministry of Economic Planning and Budget. Lagos: Lagos State Government.
- LAGOS EKO PROJECT (2013). Environmental and Social Management Framework (ESMF) Lagos eko additional financing project: <http://documents.shihang.org/curated/zh/905551468098681320/E44010P148593000Box382114B00PUBLIC0.doc>.
- Larsson, M., Bratt, L. & Sandahl, J. (2011). Hållbar utveckling och ekonomi inom planetens gränser. Lund: Författarna och Studentlitteratur.
- Larsson, M., Bratt, L. & Sandahl, J. (2011). Sustainable development and economy within the planet's boundaries. Lund.
- Lawal, M. (2010). Waste Management in Lagos Metropolis. 18 February 2012, from Centre for Lagos State Studies- Adeniran Ogunsanya College of Education (CEFOLASS AOCOED): <http://cefolassaocoed.net> (2011). <http://www.lawma.gov.ng> den (accessed on 20/03/2012)
- Lecture 4.1: Thermoplastics and Thermosets: http://content.inflibnet.ac.in/data-server/eacharyadocuments/55d31af3e413010f24d8f40cINFIEP_201/4093/ET/201-4093-ET-V1-S1_lecture1.pdf (accessed on 06/07/2019).
- Lindhqvist, T. (2000). Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems IIIIEE, Lund University.
- Litter monitoring body (2003). The National Litter Pollution Monitoring System Litter Monitoring Body System Results Report-May 2003: <http://www.litter.ie/docs/DoEHLG%20System%27s%20Results%20Report%20Final%202002.pdf>
- Longe, E., Longe, O., & Ukpebor, E. (2009). People's Perception on Household Solid Waste Management in Ojo Local Government Area in Nigeria. *Iran Journal of Environmental Health Science and Engineering*, 6(3), 201-208.
- Matten, D., & Moon, J. (2008). Implicit and explicit CSR: A conceptual framework for a comparative understanding of corporate social responsibility. *Academy of Management Review*, 33(2), 404-424.

- MauroAnastasio & James Nix. (2016). Plastic Bag Levy in Ireland. (Institute European Environmental Policy). (Green Budget Europe):<https://ieep.eu/uploads/articles/attachments/0817a609-f2ed-4db0-8ae005f1d75fbaa4/IE%20Plastic%20Bag%20Levy%20final.pdf?v=63680923242>.
- Ministry of Physical planning Lagos State. Map of Lagos Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2005b). Ordinance on the avoidance and recovery of packaging wastes (Packaging ordinance—Verpackungsverordnung—VerpackV1) of 21 August 1998. Federal Law Gazette, 1, 2379.
- Monowar, M., & Humphrey, J. (2013). Stakeholder expectation of corporate social responsibility practices: A study on local and multinational corporations in Kazakhstan. *Corporate Social Responsibility and Environmental Management*, 20, 168-181. <http://dx.doi.org/10.1002/csr.1283>.
- Muyiwa, L. A. (2018). Assessment of the Source Separation of Household Solid Wastes in Nigeria (A case study of Alimosho Local Government Area, Lagos).
- Nakajima, L. & W. Vanderburg. (2006). A Description and Analysis of the German Packaging Take-Back System: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1010.1291&rep=rep1&type=pdf>.
- Ndubuis-Okola, P. U., Anekwe, R. I. & Attah, E. Y. (2016). Waste Management and Sustainable Development in Nigeria: A Study of Anambra State Waste Management Agency. *European Journal of Business and Management*, Vol.8 (17):https://www.researchgate.net/publication/319341663_Waste_Management_and_Sustainable_Development_in_Nigeria_A_Study_of_Anambra_State_Waste_Management_Agency.
- NPC (1991). National Population Commission, Official Gazette. Abuja, Nigeria.
- NPC (2006). National Population Commission, Official Gazette. Abuja, Nigeria.
- OECD (2001) Extended Producer Responsibility: A Guidance Manual for Governments. OECD, Paris, France.
- OECD (2016) Extended Producer Responsibility - Guidance for efficient waste management. OECD, Paris.
- Omofonmwan, S. I. & G. I. Osa-Edoh (2008). The Challenges of Environmental Problems in Nigeria. Geography and Planning and 2 Educational Foundation, Ambrose Ali University Ekpoma, Nigeria.
- Onibokun, A. G. (1985). Housing in Nigeria, Nigerian Institute for Social and Economic Research (NISER), Ibadan the Built & Human Environment Review, Volume 3, 2010 116.
- Organization for Economic Cooperation and Development Group on Pollution Prevention and Control (1998). Extended producer responsibility Phase 2: Case study on the German packaging ordinance. Paris: Author.
- Oshodi, L. (2013). Flood management and governance structure in Lagos, Nigeria. *Regions Magazine*, 292:22-24. DOI:10.1080/13673882.2013.10815622.
- Pakistan Environmental Protection Agency, 2005. Guideline for solid waste management: <http://www.who.or.id/eng/contents/aceh/wsh/books/es/ES07CD.pdf>.
- Phillips, R. R., Freeman, R. E., & Wicks, A. C. (2003). What stakeholder theory is not. *Business Ethics Quarterly*, 13, 479-502.

- Phillips, T. & Amp Horwood, C. (2007). *Tomorrow's Crises Today: The Humanitarian Impact of Urbanisation*. Nairobi Kenya, OCHA/IRIN, ISBN-10:9211319641, PP:122.
- Pritish Behuria (2019). The comparative political economy of plastic bag bans in East africa: why implementation has varied in Rwanda, Kenya and Uganda: <https://ideas.repec.org/p/bwp/bwppap/372019.html>.
- Quarterly Population Report, First Quarter (2014). Edmonton: Alberta Treasury Board and Finance.
- Research Briefing Emerging Markets: https://www.dbresearch.de/prod/dbr_internet_deprod/prod0000000000333240/nigeria%3a_the_no__1_african_economy.pdf Researcher,15 (2) 4–14. April 15, 2014. (accessed on 21.05.2019).
- Richard C. Thompson (2017). Future of the sea plastic pollution:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/634433/Future_of_the_sea_-_plastic_pollution_final.pdf.
- Robert, K. Y. (1994). *Case Study Research. Design and Methods* 4 th ed.
- Ruttan, V. W. (1991). Sustainable growth in agricultural production: poverty, policy and science. Unpublished paper prepared for International Food Policy Research Institute Seminar on Agricultural Sustainability, Growth, and Poverty Alleviation, Feldafing, Germany, Sept. 23.
- Rwanda Vision (2020). Revised 2012. http://www.minecofin.gov.rw/fileadmin/templates/documents/NDPR/Vision_2020_.pdf.
- Santra, S. C. (2011). *Environmental Science*. London, New Central Book Agency.
- Sascha, T (2017). Introduction to the German Federal System:<https://myanmar-en.fnst.org/sites/default/files/uploads/2017/07/07/germanfederalismenglishversion.pdf>.
- Saskatchewan SINP | KFA Consultant: <https://kfaconsultant.com/immigration/immigration-to-canada/saskatchewan-sinp/> 20/09/2019.
- Schwartz M. S. & Carroll A. B. (2003). Corporate social responsibility: a three-domain approach. *Business Ethics Quarterly* 13(4): 503–530.
- Sharp A., Høj S. & Wheeler M. (2010) 'Proscription and its impact on anti-consumption behavior and attitudes: the case of plastic bags', *Journal of Consumer Behaviour*, 9 (Nov.- Dec.), 470-484.
- SPI (2019). A vision for a circular economy for plastics in Canada the benefits of plastics without the waste and how we get it right:<https://institute.smartprosperity.ca/sites/default/files/report-circulareconomy-february14-final.pdf>.
- SSWM (2017). Saskatchewan Solid Waste Management Strategy Discussion Paper March 2017:<http://publications.gov.sk.ca/documents/66/97825-Solid%20Waste%20Management%20Strategy%20Discussion%20Paper.pdf>.
- STAP (2018). Plastics and the circular economy: <https://www.thegef.org/sites/default/files/publications/PLASTICS%20for%20posting.pdf>.
- Statistics Canada (2014). Dwelling characteristics and household equipment, by province. Retrieved May 2014, January 29 from Government of Canada: <http://www.statcan.gc.ca/tablestableaux/sum-som/101/cst01/famil133j-eng.htm>.

- Strasser, Susan. (1999). *Waste and want: a social history of trash*. New York City: Metropolitan Books. Pp. 355.
- Swedish Institute (2013 – 2018). *The Swedish Recycling Revolution*: <https://sweden.se/nature/the-swedish-recycling-revolution/>.
- Tacoli, C. (2012). *Urbanization, Gender and Urban Poverty: Paid Work and Unpaid Carework in the City*. International Institute for Environment and Development: United Nations Population Fund, London, UK.
- Taneja, S., Taneja, P., & Gupta, R. (2011). Researches in corporate social responsibility: A review of shifting focus, paradigms, and methodologies. *Journal of Business Ethics*, 101(3), 343-364: <http://dx.doi.org/10.1007/s10551-010-0732-6>.
- The Environmental Management and Protection Act (2010). *An Act respecting the Management and Protection of the Environment, repealing The Clean Air Act, The Environmental Management and Protection Act, 2002, The Litter Control Act and The State of the Environment Report Act and making consequential amendments to certain Acts*: <http://www.saskh2o.ca/pdf/empa2010.pdf>.
- The Open University (2017). Study session 8 - solid waste reduction, reuse and recycling: <http://www.open.edu/openlearncreate/mod/oucontent/view.php?id=80574>.
- UN habitat (2012). *State of the world's cities 2012/2013. Prosperity of Cities*: <https://sustainabledevelopment.un.org/content/documents/745habitat.pdf>.
- UNDP (2008). *Assessment of development results evaluation of UNDP contribution Rwanda*: <http://www.oecd.org/countries/rwanda/41105593.pdf>.
- UNEP (2013). *Municipal solid waste: Is it garbage or gold?*: <https://wedocs.unep.org/handle/20.500.11822/8457>.
- UN-Habitat (2011). *A Policy Guide to Rental Housing in Developing Countries; Quick Policy Guide Series*.
- UN-Habitat (2014). *The state of African cities 2014*. <http://unhabitat.org/the-state-of-african-cities-2014> (accessed on 19.04.2019).
- UN-HABITAT (2010). *Collection of Municipal Solid Waste in Developing Countries*. United Nations Human Settlements Programme (UN-HABITAT), Nairobi.
- United Nations Environment Programme (2018). *Single-use plastics: A roadmap for sustainability*: <https://wedocs.unep.org/handle/20.500.11822/25496>.
- United Nations General Assembly (1987). *Report of the World Commission on Environment and Development: Our Common Future* <https://sustainabledevelopment.un.org/content/documents/5987our-common-Future>.
- United States Environmental Protection Agency (2017). *Reduce, Reuse, Recycle*: <https://www.epa.gov/recycle>, January 2018.
- UNPD (2012a). *World Urbanization Prospects, the 2011 Revision*. Department of Economic and Social Affairs, Population Division, United Nations, New York: http://esa.un.org/unup/pdf/WUP2011_Highlights.pdf (accessed on 09.10.13).
- Werner, S., Budziak, A., van Franeker, J., Galgani, F., Hanke, G., Maes, T., Matiddi, M., Nilsson, P., Oosterbaan, L., Priestland, E., Thompson, R., Veiga, J. & Vlachogianni, T. (2016). *Harm Caused by Marine Litter*. MSFD GES TG Marine Litter – Thematic Report. JRC Technical Report. Luxembourg: European Union.
- World Bank (2012). *What a Waste: A Global Review of Solid Waste Management*. Urban Development Series Knowledge Papers: <http://documents.worldbank.org/curated/>

- en/2012/03/16537275/waste-global-review-solid-waste-management (accessed on 09/10/2013).
- <https://www.dw.com/en/plastic-waste-and-the-recycling-myth/a-45746469/> (accessed on 02/09/2018).
- https://www.theodora.com/maps/https://geographic.org/maps/new2/germany_maps.html (accessed 01/03/2018).
- [www.aberc.com:https://www.aberc.com/about-us/about-aberc](http://www.aberc.com/about-us/about-aberc) (accessed on 21/07/2019).
- [www.albertadepot.ca: https://albertadepot.ca](http://www.albertadepot.ca) (accessed on 21/07/2019).
- [www. Recyclebc.ca:https://Recyclebc.ca](http://www.Recyclebc.ca) (accessed on 22/07/2019).
- [www.businessnewsreport.com.ng:https://businessnewsreport.com.ng/coca-cola-chooses-plastic-bottle-collection-over-aluminium-cans-to-cut-carbon-footprint](http://www.businessnewsreport.com.ng/https://businessnewsreport.com.ng/coca-cola-chooses-plastic-bottle-collection-over-aluminium-cans-to-cut-carbon-footprint)(accessed on 06/06/2018).
- [www.etvghana.com:https://www.etvghana.com/price-of-pure-water-to-be-increased-to-gh%2%A20-30p-on-november-12-2018](http://www.etvghana.com/https://www.etvghana.com/price-of-pure-water-to-be-increased-to-gh%2%A20-30p-on-november-12-2018) (accessed on 03/12/2018).
- [www.gabot.de:https://www.gabot.de/ansicht/der-gruene-punkt-sicherung-der-produktverantwortung-386912.html](http://www.gabot.de/https://www.gabot.de/ansicht/der-gruene-punkt-sicherung-der-produktverantwortung-386912.html) (accessed on 24/11/2019).
- [www.government.nl:https://www.government.nl/topics/circular-economy/from-a-linear-to-a-circular-economy](http://www.government.nl/https://www.government.nl/topics/circular-economy/from-a-linear-to-a-circular-economy) (accessed on 02/11/2019).
- [www.greenpak.com.mt:https://www.greenpak.com.mt/the-green-dot-trade-mark](http://www.greenpak.com.mt/https://www.greenpak.com.mt/the-green-dot-trade-mark) (accessed on 12/10/2019).
- [www.handelsblatt.com:https://www.handelsblatt.com/today/politics/the-plastic-trail-how-germanys-recycling-ends-up-in-malaysian-dumps-/24037020.html?ticket=ST-9908662-A1ySzlXhj1icAwidGaDG-ap6](http://www.handelsblatt.com/https://www.handelsblatt.com/today/politics/the-plastic-trail-how-germanys-recycling-ends-up-in-malaysian-dumps-/24037020.html?ticket=ST-9908662-A1ySzlXhj1icAwidGaDG-ap6) (accessed on 12/07/2019).
- [www.mappery.com:http://www.mappery.com/maps/Nigeria-Map.mediumthumb.png](http://www.mappery.com/http://www.mappery.com/maps/Nigeria-Map.mediumthumb.png) (accessed on 09/07/2019).
- [www.nptel.ac.in:https://nptel.ac.in/courses/112107085/module4/lecture1/lecture1.pdf/](http://www.nptel.ac.in/https://nptel.ac.in/courses/112107085/module4/lecture1/lecture1.pdf/) (accessed on 06/07/2019).
- [www.oxygreenplastics.com:http://oxygreenplastics.com/blogs/circular-economy-for-plastics](http://www.oxygreenplastics.com/http://oxygreenplastics.com/blogs/circular-economy-for-plastics) (accessed on 21/10/2018).
- www.ourworldindata.org/plastic-pollution (accessed on 21/12/2020)
- [www.ppp-nigeria.com:http://www.ppp-nigeria.com/nigeria-plastic-print-package.html](http://www.ppp-nigeria.com/http://www.ppp-nigeria.com/nigeria-plastic-print-package.html) (accessed on 30/05/2018).
- www.statista.com (2017): The Statistics Portal. <https://www.statista.com/statistics/382264/total-population-of-nigeria> (accessed on 30/11/2018).
- [www.theconversation.com:http://theconversation.com/as-more-developing-countries-reject-plastic-waste-exports-wealthy-nations-look-for-solutions-at-home-117163](http://www.theconversation.com/http://theconversation.com/as-more-developing-countries-reject-plastic-waste-exports-wealthy-nations-look-for-solutions-at-home-117163) (accessed on 13/08/2018).
- [www.thewillnigeria.com:https://thewillnigeria.com/news/opinion-lagos-the-menace-of-plastic-litter-human-waste-and-poor-sanitation/](http://www.thewillnigeria.com/https://thewillnigeria.com/news/opinion-lagos-the-menace-of-plastic-litter-human-waste-and-poor-sanitation/) (21/05/2018).
- [www.von.gov.ng:https://www.von.gov.ng/lagos-begins-capping-of-controversial-dumpsite](http://www.von.gov.ng/https://www.von.gov.ng/lagos-begins-capping-of-controversial-dumpsite) (accessed on 14/03/2018).

[www://hazmatmag.com:https://hazmatmag.com/2020/08/update-on-site-rehabilitation-programs-in-alberta-british-columbia-and-saskatchewan](https://hazmatmag.com/2020/08/update-on-site-rehabilitation-programs-in-alberta-british-columbia-and-saskatchewan) (accessed on 12/11/2019).

Zadek, S. (2000). *Doing Good and Doing Well: Making the Business Case for Corporate Citizenship*. New York: The Conference (Board Research Report).

Ziblatt, D. (2004). Rethinking the Origins of Federalism: Puzzle, Theory, and Evidence from Nineteenth-Century Europe.” *World Politics* 57 (1): 70–98.

REFERENCES FROM VISITATIONS, INTERVIEWS AND FIELD OBSERVATIONS

Allentaylor, K. O. (2018). Field Observation and survey on plastic waste management system in Nigeria (June - August, 2018).

Allentaylor, K. O. (2019). Field Observation and survey on plastic waste management system in Germany (March 2019).

Allentaylor, K. O. (2019). Field Observation and survey on plastic waste management system in Saskatchewan (SK), Canada (September, 2019).

Allentaylor, K. O. (2019). Field Observation and survey on plastic waste management system in Alberta (AB), Canada (October, 2019).

Allentaylor, K. O. (2019). Field Observation and survey on plastic waste management system in British Columbia (BC), Canada (November, 2019).

Personal and formal Interview with the head of directors Cleaner Lagos Initiatives (CLI) also the serving special Adviser to the Governor of Lagos State, Engr. Mr. Adebola Shabi (Allentaylor, K.O. Interviewer, 14, June 2018).

Personal and formal Interview with the Agency of Lagos state waste management System in Nigeria (Allentaylor, K.O. Interviewer, 21, July 2018).

Personal and Informal Interview with local scavengers(waste-pickers) in Lagos State, Nigeria (Allentaylor, K.O. Interviewer, 23, July 2018).

Phone Interview with the head of directors of ALBA Group in Berlin, Germany (Allentaylor, K.O. Interviewer, 12, March 2019).

Phone Interview with the head of directors of RDB plastics GmbH Aukrug, Schleswig-Holstein in Germany (Allentaylor, K.O. Interviewer, 14, March 2019).

Phone Interview with the head of directors of Saskatchewan Waste Reduction Council in Saskatchewan, Canada (Allentaylor, K.O. Interviewer, 21, September 2019).

Personal visit and formal Interview with the director of Recycling Council of Alberta in Alberta, Canada (Allentaylor, K.O. Interviewer, 11, October 2019).

Phone Interview with the head of directors of Recycling Council of British Columbia in British Columbia, Canada (Allentaylor, K.O. Interviewer, 06, November 2019).

Personal visit and formal Interview with the Management of SARCAN recycling drop-off center, Saskatchewan, Canada (Allentaylor, K.O. Interviewer, September, 2019).

Personal visit and formal Interview with the Management of Saskatoon landfill regional waste management site Saskatchewan, Canada (Allentaylor, K.O. Interviewer, September, 2019).

Personal visit and formal Interview with the Management of Shepard landfill, Calgary, Alberta, Canada (Allentaylor, K.O. Interviewer, October, 2019).

Personal visit and formal Interview with the Management of East Calgary Landfill, Calgary, Alberta, Canada (Allentaylor, K.O. Interviewer, October, 2019).

Personal visit and formal Interview with the Management of Alberta recyclable depot, Calgary, Alberta (Allentaylor, K.O. Interviewer, October, 2019).

Personal visit and formal Interview with the Management of Cascades recovery inc Toronto, Canada (Allentaylor, K.O. Interviewer, November 2019).

APPENDICES

**APPENDIX 1: QUESTIONNAIRES ADMINISTERED TO POLICYMAKERS
AND OTHER STAKEHOLDERS IN LAGOS STATE, NIGERIA**

1. Do you think there are challenges of plastic waste pollution in Lagos state?

.....

2. What are the policies or laws to address these challenges?

.....

3. Have you heard about the corporate social responsibility” (CRS) and extended producers responsibility” (EPR) concepts?

.....

4. Can the government integrate the EPR and levies program as a measure to minimize plastic pollution in Lagos state?

.....

5. In your opinion do you think those policies will reduce plastic waste in Lagos state?

.....

6. What other things do you think the government can do to reduce plastic waste in Lagos state?

.....

APPENDIX 2

20. The State shall protect and improve the environment and safeguard the water, air and land, forest and wild life of Nigeria.

21. The State shall -

(a) protect, preserve and promote the Nigerian cultures which enhance human dignity and are consistent with the fundamental objectives as provided in this Chapter; and

(b) encourage development of technological and scientific studies which enhance cultural values.

22. The press, radio, television and other agencies of the mass media shall at all times be free to uphold the fundamental objectives contained in this Chapter and uphold the responsibility and accountability of the Government to the people.

23. The national ethics shall be Discipline, Integrity, Dignity of Labour, Social, Justice, Religious Tolerance, Self-reliance and Patriotism.

24. It shall be the duty of every citizen to -

(a) abide by this Constitution, respect its ideals and its institutions, the National Flag, the National Anthem, the National Pledge, and legitimate authorities;

(b) help to enhance the power, prestige and good name of Nigeria, defend Nigeria and render such national service as may be required;

Adopted from: Constitution of the Federal Republic of Nigeria 1999. Chapter II Fundamental Objectives and directive Principles of State Policy. (Section II, Number 20: Environmental objectives). https://publicofficialsfinancialdisclosure.worldbank.org/sites/fdl/files/assets/law-library-files/Nigeria_Constitution_1999_en.pdf (See Appendix 2)

APPENDIX 3

Power to Make Regulation

19 (1) Without prejudice to the powers conferred on the Commissioner of the Environment under the Lagos State Environmental Protection Agency Law, Cap. L23, 2004, the enforcing authority shall, after careful investigation, prescribe by regulations any description of process as process or establish standards, objectives or requirements in relation to particular prescribed processes or particular substances for the purpose of carrying into effect the provisions of this Law.

(2) Regulations made under subsection (1) above shall impose:

- (a) acceptable standards or criteria to control the pollution of the environment;
- (b) standards for effluent;

- (c) water quality standards and monitoring reflecting the latest scientific knowledge on:
 - i. the kind and extent of identifiable effects on health and welfare including, but not limited to plankton, fish, shellfish, wildlife, plants life, shorelines, beaches aesthetics and recreation which may be expected from the presence of pollutants in any water body, including ground water;
 - ii. on the concentration and dispersal of pollutants on them by products, through biological, physical and chemical processes; and
 - iii. on the effects of pollutants on biological community diversity, productivity, stability, including information on the factors affecting rates of eutrophication and rates of organic and inorganic sedimentation for varying types of receiving waters ;
- (d) Hazardous waste including but not limited to electronic wastes and healthcare waste and chemical waste.
- (e) emission standards for each category or subcategory of major sources and areas sources of hazardous air pollutants listed for regulation;
- (f) separately, for each environmental medium, the substances the release of which into that medium is to be subject to control; and
- (g) emission standards for each category or subcategory of major sources and areas of sources of hazardous air pollutants listed for regulation pursuant to subsection (1) of this section.
- (h) in relation to releases of any substance from prescribed processes into any environment medium, prescribe standard limits for-
 - i. the concentration, the amount or the amount in any period of that substance which may be so released; and
 - ii. any other characteristics of that substances in any circumstances in which it may be so released;
- (i) in relation to releases of any substance from prescribed processes into any environment medium, prescribe standard requirements for the measurement or analysis of, or releases of, substances for which limits have been set under paragraph (f) above; and

- (j) emission standards from vehicles, plants and equipment including generating plants.
 - (k) noise standard for any product or class (or class thereof) which emits noise capable of adversely affecting the public health or welfare; or
 - (l) noise standard for any product or class (or class thereof) which is sold wholly or in part on the basis of its effectiveness in reducing noise.
 - (m) noise pollution standard in any residential, religious, commercial, industrial or any other premises with a view to controlling the psychological and physiological effects of noise on humans and the effects of noise on domestic animals, wildlife and property.
 - (d) procedure for application for permit under this Law.
- (3) Without prejudice to foregoing section, the enforcing authority shall in relation to emission standards regulated under this subsection and applicable to new or existing sources of hazardous air, water, and land pollutants require the maximum degree of reduction in emission of the hazardous air, water and land pollutants (including a prohibition on such emissions, where achievable) that the enforcing authority, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable through the application of measures, process, methods, systems or techniques including, but not limited to, measures which –
- (a) reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitutions of materials or other modifications,
 - (b) enclose systems or process to eliminate emissions,
 - (c) collect, capture or treat such pollutants when released from a process, stack or storage or fugitive emission point,
 - (d) are designs, equipment, work practice, or operational standards (including requirements for operator training or certification).
- (4) The enforcing authority may, after careful investigation, and in collaboration with the Ministry, other relevant State and Federal

Ministries and Agencies connected with environmental, health and safety matters and industries prepare or develop comprehensive programme for preventing, reducing or eliminating the pollution of the air, land and navigable water and underground waters and improving the sanitary condition land, air as well as of surface and underground waters of Lagos State.

- (5) The enforcing authority shall develop comprehensive framework of regulation, standards and policies to protect the environment;
- (6) Without prejudice to the foregoing section, the enforcing authority shall in relation to any developmental activities or processes to be undertaken within the State require, appraise and ensure that a detailed environmental impact assessment report is produced and complied with.

Prohibition of discharge of substances, etc into the environment

- 20 (1) No person shall, except under a permit granted by the enforcing authority and in accordance with the conditions attached to the permit, carry on a prescribed process or activities or discharge any substances into the environment after the commencement of this Law other than as determined for that process by or under Regulation made pursuant to section 19(1) above.

Application for permit

- 21 (1) An application for a permit shall be made to the enforcing authority in accordance with the procedure prescribed under Regulations made pursuant to section 19(1) above.
- (2) An application shall not be granted unless the enforcing authority considers that the applicant will be able to carry on the process so as to comply with the conditions which would be included in the permit.

Dumping and Burying of Toxic or Radioactive, Medical Waste and Harmful Wastes

- 22 As from the commencement of this Law no person or group of persons shall dispose of, dump or bury or cause or allow to be buried or dumped in or over any land or water within the State any solid or liquid, or toxic, hazardous or radioactive substance or harmful waste as may be designated as such without the express participation of the enforcing authority and in accordance with the regulation or guideline of the enforcing authority.

Adopted from: ENVIRONMENTAL LAW OF LAGOS STATE. A Law to provide for the Management, Protection and Sustainable. Development of the Environment in Lagos State. Draft copy of Lagos State Environmental law (Appendix 3 of page 28-31).

APPENDIX 4

<p>All design-for-recycling motivated product design changes should be evaluated from a life-cycle perspective to ensure that end-of-life considerations are balanced with other eco-design principles. This can be carried out by adapting the following:</p> <ul style="list-style-type: none"> ➤ Adopting product specific approach. ➤ Assessment of end of life disposal in design phase ➤ Strengthen reverse logistics. ➤ Embrace extended producer responsibility (EPR) and product stewardship. ➤ Strengthening take back programs. ➤ Alignment of Marketing Strategies. ➤ Market recycled products. ➤ Increase vendor and customer awareness. ➤ Promote discounts for customer returns. ➤ Increased marketing of green raw materials and green production processes. ➤ Set waste recovery targets. ➤ Provide permanent collection infrastructure. ➤ Remanufacture and reuse • Work with recyclers. ➤ Disclose source of minerals in products. ➤ Adopt proactive and not reactive stance to sustainable supply chain. ➤ Provide design for disassembly to public. ➤ Use recycled materials where possible. <p>3.3.5.2. RESPONSIBILITIES OF COLLECTION CENTRES</p> <p>Collection centres should do the following</p> <ol style="list-style-type: none"> 1. Provide detail address, telephone numbers, e-mail to the general public. 2. Ensure that the e-waste collected by them is stored in a secured manner till it is sent to registered dismantlers or recyclers. 3. Ensure that no damage is caused to the environment as a result of storage and transportation of e-waste. 4. Area of the collection point/ storage should be able to accommodate separated/sorted WEEE/ E-waste with respect to size. 5. Collection point/ storage area should have impermeable surface with sealed drainage system. Sites for storage (including temporary storage) of WEEE/E-waste prior to their treatment should have impermeable surface for appropriate areas with the provision of spillage collection facilities and where appropriate, decanters and cleanser-degreasers. 6. Sites for storage (including temporary storage) of WEEE/E-waste prior to their treatment should have weatherproof covering for appropriate areas. 7. Keep records of E-waste handled and make sure records are available for scrutiny by the government agencies. <p>40</p>	<p>3.3.5.3. RESPONSIBILITIES OF CONSUMERS OR BULK CONSUMER</p> <p>Bulk consumers of electrical and electronic equipment should ensure that:</p> <ul style="list-style-type: none"> • e-waste generated by them is channelled to authorised collection centres or registered dismantlers or recyclers or is returned to the pick up or take back services provided by the Producers/Assemblers; and • Shall maintain records of e-waste generated by them and make such records available for scrutiny by the environmental government agency. <p>3.3.5.4. RESPONSIBILITIES OF RETAILERS</p> <ol style="list-style-type: none"> 1. Retailers are expected to maximize collection by providing more service to consumers with more easily accessible collection points and a direct fulfillment of producer obligations for their own-branded products. 2. An "all-for-all" take-back mechanism should be considered: selling a product category means take-back of any type of equipment, free of charge with an obligation to forward collected waste to collection points or Producers/Assemblers. 3. In this collection mechanism, consumers can take back WEEE/ E-waste to retail stores that distribute similar products. They may give back the product at the retail store depending upon purchase of a new product, or without any purchase required, and is sometimes done at the point of home delivery and installation of a new item by the retailer/distributor. Where available, this service is usually free to private households. This can be effected over a period of time. 4. Retailers should also record the quantity of e-waste sold and should make it available to government inspectors for scrutiny. 5. Ensure that imported used electrical and Electronic Equipment (UEEE) or its dismantled parts imported are registered with NESREA and State Environmental Protection Agency (LASEPA) as appropriate for ease of compliance monitoring. <p>3.3.5.5. RESPONSIBILITIES OF DISMANTLER AND RECYCLER</p> <ul style="list-style-type: none"> • Every dismantler/ recycler should obtain authorization and registration from the environmental agency. • Ensure that dismantling processes are in accordance to standard and guidelines set out by the environmental agencies. • Ensure that the facility and recycling processes are in accordance with the standards laid down by the environmental agencies. • Make available all records of recycled e-waste to the environmental agencies. • Ensure that residue generated thereof is disposed off in hazardous waste storage and disposal facility. <p>41</p>
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<ul style="list-style-type: none"> • Ensure that dismantled parts to be exported are registered with National regulatory Agency in charge (NESREA). • Ensure that imported used electrical and Electronic Equipment (UEEE) or its dismantled parts imported are registered with NESREA and State Environmental Protection Agency (LASEPA) as appropriate for ease of compliance monitoring. <p>3.3.5.6. RESPONSIBILITIES OF RECYCLERS</p> <ol style="list-style-type: none"> 1. Recycler's should develop best available technologies and practices for the recycling sector particularly monitoring practices for outgoing material fractions. 2. Avoid illegal secondary trading with its associated adverse environmental effects by installing and complying with transparent substance flow monitoring and reporting. 3. Ensure that imported used electrical and Electronic Equipment (UEEE) or its dismantled parts imported are registered with NESREA and State Environmental Protection Agency (LASEPA) as appropriate for ease of compliance monitoring. <div data-bbox="295 1608 750 1921" data-label="Diagram"> <pre> graph TD A[Product Collection] --> B{Test/sort} B --> C[Resale/Re-use of the product] B --> D[Disassemble] D --> E[Size reduction] E --> F[Separation of materials] F --> G[Disposal] D --> H[Recovery of useful materials] D --> I[Recovery of energy] </pre> </div> <p>Recyclers should also do the following:</p> <ol style="list-style-type: none"> 4. Follow sound End of life management. <p>42</p>	<ol style="list-style-type: none"> 5. Adhere to End of Life (EOL) regulations as provided by the producers/assemblers. 6. Works towards strengthening reverse logistics. 7. Creates jobs. 8. Creates awareness. 9. Works with industry for take back programs. 10. Improved E-waste Collection. 11. Support the infrastructure for collection of e-waste. 12. Adopting efficient recycling processes in their facility(ies) 13. Ensure recycling residues are disposed in an environmentally sound manner. 14. Invest in advanced sorting technology. 15. Invest in Improved technology for recovery. <p>3.3.5.7. RESPONSIBILITIES OF GOVERNMENT AGENCIES</p> <p>E-waste is a global and societal problem because of its long term environmental impact; its management system should be effectively regulated by policy mechanism. Therefore it will be the responsibility of:</p> <p>MINISTRY OF ENVIRONMENT</p> <ul style="list-style-type: none"> • Develop a strategic life cycle management plan in conjunction with the Science and Technology Ministry on their responsibility of automation of government activities. • Develop checklist in collaboration with the Lagos State Public Procurement Agency on electronic equipment towards meeting sustainable green procurement. • Liaise with the ministry of Education to develop curricula on environmental sound management of waste in schools. • Develop an all-encompassing strategic plan for implementing the E-waste policy, detailing the costs, time frames, targets, outputs and outcomes; <p>The key outcomes for Lagos State by 2025 are stated as follows:</p> <ol style="list-style-type: none"> 1. Lagos State manages E- waste, including hazardous waste, in an environmentally safe, scientific and sound manner, and has reduced the amount per capita of waste disposed in Landfill by 50 % of baseline year (2015) statistics in 2025. <p>43</p>
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<p>2. E- Waste streams are routinely managed as a resource to achieve better Environmental, Social and Economic outcomes, including saving water, energy, greenhouse gas emissions and finite resources, and to increase productivity of the land.</p> <p>3. Establishment of self sustaining E- waste Processing Plants in Lagos State by year 2020 for separation and dismantling of e-waste including domestic appliances, ICT electronics and mobile phones.</p> <p>4. Increased opportunities to safely manage, reduce and recycle E- waste are available to all Lagosians, including approaches that have been tailored to meet the needs of the informal sector for proper collection, dismantling and recycling of e-waste with skills transfer and revenue generation from a baseline status of 2015.</p> <p>5. The risks associated with E- waste and hazardous substances are understood and managed to minimize current and intergenerational legacy issues.</p> <ul style="list-style-type: none"> • Lagos State manages its products, materials and chemicals that contain potentially hazardous substances, in particular those that are persistent, bio-accumulative and toxic, consistent with its national, international obligations and using best available evidence, techniques and technologies. • Local stockpiling of E- waste and hazardous waste has been significantly reduced, particularly in warehouses and on landfill sites by 50% in 2017 from the baseline year of 2015. • There are consistent and clear requirements for disposal of E- waste and hazardous material, and for content labelling of manufactured e- goods, that also provide a level playing field for Nigerian manufacturers/assemblers, importers and inform the consumers. <p>6. In Lagos State, it will be illegal by 2025 to send E- waste to the landfill by any organised private sector or government agency or private individual without a license.</p> <hr/> <p style="text-align: center;">LAGOS STATE ENVIRONMENTAL AGENCY (LASEPA)</p> <p>The Lagos State Environmental Protection Agency (LASEPA) as an appropriate arm of the government should among its other responsibilities:</p> <ol style="list-style-type: none"> 1. Set up a departmental in the LASEPA to manage the E- waste program. 2. Institute data bank on e waste streams from all governmental, commercial and industrial establishment and educational institutions 3. Carry out a baseline survey and analysis of the E-waste threat in the state and benchmark e- waste recovery in the state; 4. Create a form where information on collection, production, dismantling and recycling are documented by all necessary stakeholders. 5. Adopt sound end of life management technology in the life cycle of e waste stream; <p style="text-align: center;">44</p>	<ol style="list-style-type: none"> 6. Develop sustainable models for E-waste management; 7. Encourage set up of facilities to handle refurbishment of unwanted electrical and electronic equipment and/or E-waste recycling across the state; 8. Reduce landfill collection of E- waste with collection and recovery targets on an annual basis; 9. Develop incentives for E- waste to be collected separately and in sorted categories; 10. Develop incentives for establishment of sustainable E-waste disposal facilities through mutually beneficial reuse and/or recycling schemes. 11. Provide job generation in the recycling sector by supportive policies; 12. Streamlining operations of scrap vendors by awareness and incorporation into government authorized vendor list; 13. Institute appropriate regulations meeting global standards for E-waste disposal and recovery; 14. Create or adopt national guidelines and standards for recycling and dismantling. 15. Review and amend the relevant State Laws and Acts to address E-waste management, including issues of procurement, manufacturer/distributor responsibility and end-of-life equipment take-back; 16. Regularly inspect all private and public collection centers, storage facilities and recycling centers to ensure compliance with guidelines and standards; <p>16.1. Management of safety and health risks arising from landfill gas emissions including responsibility to meet international obligations on the reduction of dioxins and furans from open burning of e- waste and other waste municipal stream;</p> <p>16.2. Providing incentives to reduce hazardous materials entering the waste stream;</p> <p>16.3. Ensuring disposal of e-waste in an environmentally sound manner in appropriate facilities;</p> <p>16.4. Audit of existing waste infrastructure and local capability in communities as part of essential services audit;</p> <p>16.5. Minimize the generation of e-waste, reduce the amount of e-waste for disposal, manage e-waste as a resource and ensure that waste treatment, disposal, recovery and re-use is undertaken in a safe, scientific and environmentally sound manner; and Contribute to the reduction in greenhouse gas emissions, energy conservation and production, water efficiency, and the productivity of the land.</p> <p>16.6. Encourage use of biodegradable packaging products and recharge cards, resource recovery of E waste and reduction of e- waste material sent to landfill.</p> <p style="text-align: center;">45</p>
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Adopted from: E-WASTE MANAGEMENT POLICY (Final DRAFT). <https://docplayer.net/22722394-E-waste-management-policy-final-draft.html>. The policy of the e-waste management law under the section of rights and responsibilities 3.3.5, sub-section 3.3.5.1 to 3.3.5.7 which clearly address the responsibilities of producers with the necessary help from the ministry of environment in Lagos state in order to achieve the aim of environmental sustainability (Appendix 4 page of 40-43).

PICTURES FROM VISITED SITES



Picture 1: Personal visit to East Calgary landfill Site, Calgary Alberta, Canada.



Picture 2: Recycle council of Alberta annual waste reduction conference with one of the directors at the second right image (Dr. Mrs. Christina Seidel).



Picture 3: Personal visit to Cascades recovery inc Toronto, Canada



Picture 4: Personal visit to Saskatoon landfill regional waste management site, Canada.



Shepard landfill Calgary
Thanks for the host

Picture 5: Personal visit to Shepard landfill, Calgary, Alberta, Canada