



AN ASSESSMENT OF THE ROLE OF HOUSEHOLDS IN TRANSITIONING TO
SUSTAINABLE MANAGEMENT OF PLASTIC WASTE IN THE MEGACITY OF
LAGOS, NIGERIA

Dissertation Manuscript

Submitted to Unicaf University in Zambia
in Partial fulfilment of the Requirements
for the Degree of

Doctor of Philosophy (Ph.D.)

By Ojogun Clarkson Inuwa

July, 2024

Approval of the Thesis

AN ASSESSMENT OF THE ROLE OF HOUSEHOLDS IN TRANSITIONING TO SUSTAINABLE MANAGEMENT OF PLASTIC WASTE IN THE MEGACITY OF LAGOS, NIGERIA

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Doctor of Philosophy (Ph.D.)

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Abstract

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Despite efforts made towards attaining Sustainable Plastic Waste Management (SPWM) in the megacity of Lagos-Nigeria, the extant Municipal Solid Waste Management (MSWM) practices resulted in environmental pollution and economic losses. Enquiries revealed that plastic waste mismanagement is a social problem, the implemented solutions are not human-based but mechanically-based. The first handlers/major generators of municipal plastic waste (households) and the informal recycling sector were neglected in the planning stages. The study sought the opinions, attitudes, beliefs, practices and culture of selected populace towards MSWM and the supposed roles of the households in transitioning to SPWM through the lenses of Circular Economy (CE) concept and the Transition Management (TM) theory, which places the study at variance to other studies in the area. The aim was to decipher how the households could be integrated into the value chain of plastic management to play sustainability roles that could steer the practice to become sustainable and globally acceptable. The mixed-explanatory-sequential-research-design that entailed a cross-sectional survey with structured questions, followed by Focus Group Discussions (FGDs) and individual interviews were used towards achieving the study purposes. Three Senatorial Districts, three Local Government Areas, nine socio-economically stratified wards and a total of 225 respondents were sampled in the survey strand. Purposive sampling in Key Informant Interviews (KII)- 4 variants of individual interviews (34 participants) and 3 FGD (28 participants) was applied until information saturation point was reached.

The findings showed a societal acknowledgement of the need to better manage plastic waste, but the society is locked-in to an unsustainable socio-technical system of MSW Management; a ‘wicked environmental problem’ which cannot be resolved through ‘command-and-control’ as practiced. Plastic waste recycling, deposit refund scheme and a shift from plastic government to governance that will seek the buy-in of the households was recommended since without it, all the would-be solutions in line with the principles of plastic CE towards loop closing were bound to die-on-arrival. A hybridization of the tenets of TMT and CE tailored to suit the Lagos context could be applied to guide the needed transition.

Keywords: Plastic Waste; Environmental Challenges; Recycling; Circular Economy; Transition Management; Lagos-Nigeria.

Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgment, the work presented is entirely my own.

AI Acknowledgment

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Dedication

First and foremost, I thank the author and finisher of my faith- Jesus Christ for keeping alive to see this day. I am extending my appreciation to everyone who contributed to the success of this work. To my supervisor, Dr Reginald Dennis Gwisai, whose encouragement and scholarly expertise remained invaluable, I will ever be grateful. To Unicaf University that granted me over 2/3rd of the tuition fees as scholarship, without which I might not have dared starting the Doctorate Programme, I remain thankful. To Unicaf University School of Doctoral Studies, I say the academic rigor was worth it, thank you all. To my God-given spouse, Clarkson-Ojogun Annet A., thank you for your prayers and understandings. To my family (natural & spiritual), my colleagues at work place, and the research participants, you are highly appreciated.

Acknowledgement

It is worthy to mention and appreciate the fact that Unicaf University authority granted me a 78% tuition fee scholarship, without which, I might not have journeyed into the programme as at then. I want to specifically thank Danboyi Victor Ojogun and Ewubor I. Eugene for their financial support towards this programme. In all, to God be the glory.

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List of Abbreviations

CDA	Community Development Association
CDC	Community Development Committee
CE	Circular Economy
CLI	Cleaner Lagos Initiative
CCU	Community Clean – up Unit
DRS	Deposit Return/Refund Schemes
EPR	Extended Producer Responsibility
FAO	Food and Agriculture Organization of the United Nations
FCT	Federal Capital Territory
FEPA	Federal Environmental Protection Agency
FESTAC 77	Second World Black Festival of Arts and Culture
FGD	Focus Group Discussion
FGN	Federal Government Nigeria
GDP	Gross Domestic Product
GWMO	Global Waste Management Outlook
HCH	Holland Circular Hotspot
HDLI	High – Density – Low – Income
HDMI	High – Density – Middle – Income
HH	Household
HI	High – Income
HS	Harmonized System
ISWM	Integrated Solid Waste Management
ISWMA	Integrated Solid Waste Management Approach
LASEPA	Lagos State Environmental Protection Agency
LAWMA	Lagos Waste Management Authority
LBS	Lagos Bureau of Statistics

LDHI	Low – Density – High – Income
LGA	Local Government Area
LI	Low – Income
LRI	Lagos Recycle Initiative
LSG	Lagos State Government
LSRDB	Lagos State Refuse Disposal Board
LSWDB	Lagos State Waste Disposal Board
MDAs	Ministries, Departments & Agencies
MDHI	Medium – Density – High – Income
MDLI	Medium – Density – Low – Income
MI	Medium – Income
MOE	Lagos State Ministry of the Environment
MOE & WR	Lagos State Ministry of the Environment and Water Resources
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NESREA	National Environmental Standards and Regulations Enforcement Agency
NGO	Non – Governmental Organization
NPC	National Population Commission
OECD	Organisation for Economic Co-operation and Development
PE	Polyethylene
PET	Polyethylene Terephthalate
PP	Polypropylene
PPP	Public Private Partnership
PSP	Private Sector Participants
PUMAU	Public Utilities Monitoring and Assurance Unit
PVC	Polyvinylchloride

RQ	Research Question
SD	Sustainable Development
SDGs	Sustainable Development Goals
SME	Small and Medium Enterprises
SNM	Strategic Niche Management
SPSS	Statistical Package for the Social Sciences
SSWM	Sustainable Solid Waste Management
ST	Stakeholder Theory
TMT	Transition Management Theory
UN	United Nations
UNCED	United Nations' Conference on Environment and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
US – EPA	United States Environmental Protection Agency
UN – HABITAT	United Nations Human Settlements Programme
UNICEF	United Nations Children's Fund
UREC	Unicaf University Research Ethics Committee
WB	World Bank
WED	World Environment Day
WEF	World Economic Forum
WHO	World Health Organization

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CHAPTER 1: INTRODUCTION

The idea of managing solid waste to sustainability level was drawn from the concept of ‘Sustainable Development’ that arose from Brundtland’s report on Agenda 21 of the United Nations’ Conference on Environment and Development (UNCED) of 1992 in Rio de Janeiro. The report described sustainable development as the development carried out in such a way that the needs of the present generation are met without compromising the possibility of the future generations to meet their needs (UNCED, 1992). For a development to be sustainable, it must have beneficial effects in the aspects of ecology, social and the economy (UNCED, 1992). Sustainable municipal solid waste management (Pariatamby and Tanaka, 2014) should therefore be the waste management type that provides reduction in greenhouse gas emission as it provides ecological, social and economic benefits (Giurea et al., 2018; Permana et al., 2015) within where it is practiced and contribute towards the good of global environment. However, this is not the case with the obtainable solid waste management activities in most African cities, like Lagos (Adae et al., 2021; Bello et al., 2016). What is obtainable rather has serious adverse effects on the environment, the economy and the society in general (Bello et al., 2016; Oteng – Ababio et al., 2013) when compared to the preached sustainability management principles. The existing practice portends danger and the need to proffer workable solutions to the problem is very necessary (Maiyaki et al., 2020; Abila & Kantola, 2013).

The lack of capacity to properly manage generated waste usually leads to the waste constituting environmental nuisances (Ojelola et al., 2020; Ojewale, 2019). Of prominence in the solid waste fractions is the plastic waste of all sorts, of which their generation is on the rise uncontrollably and the inability to manage it sustainably, subsequently constitutes hell of nuisances in the state (Adekomaya & Ojo, 2016). Plastic pollutants in focus are the land – based macro – plastics. The plastic waste generation arises from its daily uses as plastic bags, single – used plastic in the likes of food packages for takeaway, cups, cutleries, straws, among

others. The common plastic types are made of non – biodegradable elements and they have adverse effects on the physical environment. Even when they are fragmented, they form smaller components which are toxic and contribute to the pollution of soil and water bodies (Dumbili & Henderson, 2020; Edoga et al., 2008).

Households are major generators of municipal solid waste (Olukoju, 2018; Johnstone & Labonne, 2004) in residential communities in developing nations. The generated solid waste becomes a concern when the generated waste is mismanaged or improperly handled (Ferronato & Torretta, 2019). In aiming to avoid generated waste from becoming a societal problem, it is seemingly wise for the generator's role to be fully considered and integrated in the waste management system to curtail waste leakages from in – house management amongst others. Olanrewaju and Oyebade (2019) asserted that, in order for Nigerian government to address the menaces of plastic waste, she must ensure the engagement of broad range of stakeholders in decision – making processes in order to establish a functional sustainable plastic recycling system. This research proposes to look intently into the roles that the households as major stakeholders play in the management of plastic waste in Lagos, Nigeria.

It is claimed that solid waste generation in Nigeria per annum is 42 million tonnes, of which 20% is plastic waste and that, on the average, the collected waste is less than 31% (Dumbili, 2020; Adeniran et al., 2017). The remaining wastes are disposed of indiscriminately by the generators (Adeniran et al., 2017). Nigeria ranked ninth in the global pollution of the sea as she is said to contribute between 0.13 – 0.34 million tonnes of plastic waste to the marine environment (Babayemi, 2019). Of this amount of plastic waste reaching the ocean, Lagos is said to contribute about 450,000 tonnes per annum (Dumbili, 2020). A trend that must be reduced or put an end to.

The attendant effects of unsustainable management of plastic waste as they are released into the natural environment include the blocking of drainage channels that exacerbates

flooding, farmland clogging and the aiding of wild fires, retains water that is suitable for the breeding of mosquitoes that are transmitters of malaria parasites. Some of these plastic wastes find their way into the ocean where they add to the problems and the death of many marine organisms (Dumbili, 2020; Nnaji, 2015; Edoga et al., 2008).

One of the main purposes of the research is to intently look into how households could have contributed to the existing unsustainable management of plastic waste and to decipher how the roles they play as the major solid waste generators (Ferronato & Torretta, 2019) could be appropriated to further aid the transitioning to sustainable plastic waste management in Lagos, with the view of advancing the concept of the Circular Economy (Preston et al., 2019; Valavanidis, 2018; Geissdoerfer et al., 2016). On a daily basis, Lagos is acclaimed to generate about 2,250 tonnes of plastic waste and less than 12% of the plastic waste generated in Nigeria is recycled (Kehinde et al., 2020) while the remaining might end up been unsustainably managed. Regarding the unsustainable plastic waste management, Ojewale (2019) stated that, though the possibility for a multi – billion Naira plastic recycling industry exists in the State, yet, the environment of Lagos is continually been choked by plastic waste. Babayemi et al. (2019) claimed that Nigeria ranks second in Africa in the importation and the use of plastic and this is presented in Figure 1.0 while Table 1.0(a-c) showed comparison of eight African countries with respect to plastics resin production and consumption.

Figure 1.0

Countries with highest Plastic Importation and Use in Africa



Note. Adapted from *Ensuring Sustainability in Plastics Use in Africa: Consumption, Waste Generation, and Projections*, Babayemi et al., 2019.

Table 1.0a*Plastics Resin Production in 8 African Countries*

Country/period	2009	2010	2011	2012	2013	2014	2015	Total
Plastic production (kt)								
Algeria	41	43	14	18	32	28	17	193
Egypt	421	411	463	548	578	786	770	3977
Ghana	0	1	1	2	2	2	3	11
Kenya	0	0	0	1	1	1	3	6
Morocco	47	53	53	60	61	62	60	396
Nigeria	213	260	303	335	390	396	411	2308
South Africa	1252	1229	1202	1292	1282	1362	1368	8987
Tunisia	0	0	2	2	3	3	4	14

Note. Adapted from *Ensuring Sustainability in Plastics use in Africa: Consumption, Waste Generation, and Projections*, Babayemi et al., 2019, p. 6.

Table 1.0b*Plastics Resin Plastics Consumption (kg/capita) in 8 African Countries*

Plastics consumption per capita (kg/capita)							
Algeria	12.6	13.2	14.4	15.7	18.1	19.0	20.9
Egypt	13.0	14.6	14.8	15.5	15.7	15.0	15.7
Ghana	5.7	5.7	6.0	6.1	6.7	6.9	7.4
Kenya	5.1	5.6	6.0	6.3	6.9	8.0	8.2
Morocco	14.9	14.5	15.2	16.0	16.6	17.1	18.3
Nigeria	4.4	4.6	4.9	5.0	5.4	5.8	6.0
South Africa	24.0	24.8	24.6	24.8	24.2	24.6	24.7
Tunisia	21.2	22.1	23.3	24.4	26.1	25.6	25.8

Note. Adapted from *Ensuring Sustainability in Plastics use in Africa: Consumption, Waste Generation, and Projections*, Babayemi et al., 2019, p. 6.

Table 1.0c*Plastics Resin Plastics Import and Exportation (kt) in 8 African Countries*

Plastics import (kt)								
Algeria	430	429	527	555	683	709	817	4150
Egypt	898	969	993	1054	1184	1066	1136	7300
Ghana	141	126	145	148	173	181	199	1113
Kenya	202	227	210	212	296	353	314	1814
Morocco	433	388	445	467	490	505	421	3149
Nigeria	609	656	584	579	617	702	754	4501
South Africa	323	401	420	459	423	439	250	2715
Tunisia	224	238	241	259	284	279	286	1811
Plastics export (kt)								
Algeria	0	0	0	0	0	0	0	0
Egypt	252	247	253	283	368	569	511	2483
Ghana	1	0	0	0	0	1	0	2
Kenya	3	2	2	2	1	1	0	11
Morocco	5	5	5	4	3	3	0	25
Nigeria	21	49	33	23	8	2	1	137
South Africa	357	379	339	465	421	477	348	2786
Tunisia	4	5	5	2	3	1	4	24

Note. Adapted from *Ensuring Sustainability in Plastics use in Africa: Consumption, Waste Generation, and Projections*, Babayemi et al., 2019, p. 6.

This study has become very necessary as several solutions previously proffered towards the achievement of sustainable management of plastic waste in Lagos have failed to address the problem. Some of which were Nylon Buy – back (Olukoju, 2018) Schemes, the building of plastic waste banks and recycling plants (LAWMA, 2020), the move by Federal Government

Nigeria (FGN) to place a ban the use of single – use plastic nationwide (FGN, 2020), among others. In some quarters, it is believed that the suggested and hitherto implemented solutions were too technologically focused rather than seeking solutions that are more human based (Abila & Kantola, 2013; Afangideh et al., 2012). It is reasoned that the majority of the tenets of sustainability management and circular economy components of sustainable management of waste, such as, waste reduction at source, re – use, recovery, recycling, waste sorting, plastic loop closing, among others (Geissdoerfer et al., 2016; Leusbrock et al., 2015; Ogbazi & Ezeadichie, 2014) will be more difficult to achieve if the households did not buy – in to the ideas or are not carried along the value chain of solid waste management plans in the study area. Thus, it is believed that the plastic waste can better be sustainably managed by integrating the households into the sustainable management plans of the state in order to find lasting solutions to the menaces caused by the extant improper management of plastic waste in the delineated study area.

Delineation of Study Area

Lagos covers a landmass of 358,862 hectares or 3,577km², it is located on longitude 20 42'E and 32 2'E, and between latitude 60 22'N and 60 2'N (Oketola & Osibanjo, 2009). Lagos State is situated inside the low – lying coastal zone (Oketola & Osibanjo, 2009) in tropical rainforest with its vegetal classification that ranges from saltwater swamp to fresh water swamp. Lagos State has a coastline of 171km of the nation's total coastline of 963km (Jiboye et al., 2019). About 40% of its total landmass consists of water and wetlands while 12% of the 60% that is not covered with water or wetlands is prone to flooding (Eze et al., 2016).

Lagos State's exact population figures have remained largely speculative and a thing of debate but it is estimated to have 24.6 million inhabitants as at 2015 (LSG, 2020) and as at 2006, 70% of the inhabitants lived in slums (Akanle & Adejare, 2017). According to Heinrich Boll Stiftung Nigeria (2018), a higher population of residence of Lagos dwell in the existing

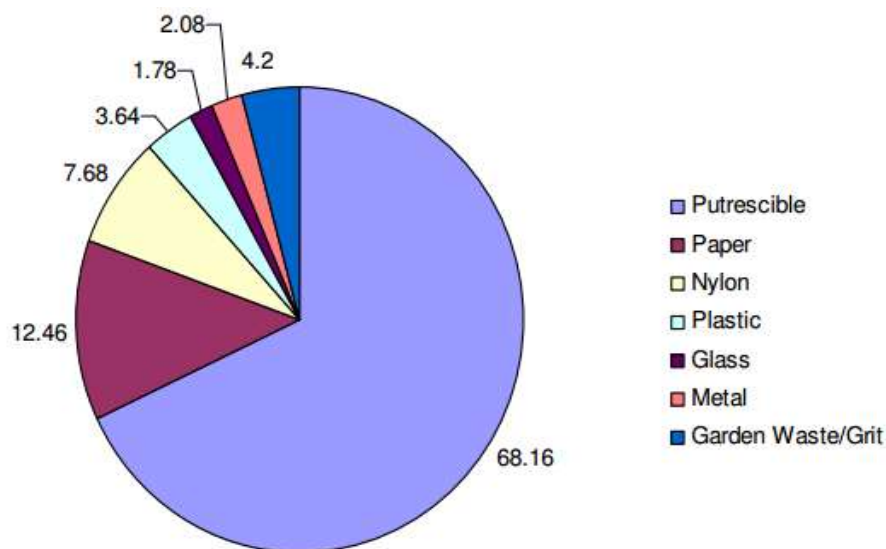
urban slums in Lagos State (cf. Popogbe, 2023; Lawanson, 2020). Of the over 100 slums that ladened the physical landscape of Lagos (Heinrich Boll Stiftung Nigeria, 2018; Lawanson, 2020), nine were considered to be most critical slums (Elias et al., 2017) and these included Agege, Ajegunle, Amukoko, Badia, Bariga, Ijeshatedo, Ilaje, Itire, and Iwaya (Heinrich Boll Stiftung Nigeria, 2018). Urban slums are usually informal settlement that are characterized with the lack of sanitation, water, other basic services (Lawason, 2020), and other social and infrastructural amenities (Heinrich Boll Stiftung Nigeria, 2018). For some reasons, such settlements often lack municipal solid waste management services, either for the fact that most of such dwellings are situated around waterfronts and no firm land to build waste infrastructures (Popogbe, 2023) or the illegality attached to the land tenure ship. However, over a decade ago, the aforementioned nine critical slums have undergone upgrading (Heinrich Boll Stiftung Nigeria, 2018; Adedayo & Malik, 2015; Adedayo & Malik 2014) through a World Bank assisted project under the Lagos Metropolitan Development and Governance Project (LMGDP) that started in 2007 (Heinrich Boll Stiftung Nigeria, 2018). Hence, basic infrastructures and social services are made available to certain levels as Adebayo and Malik (2015) concluded after their studies that there is improvement in waste disposal services, accessibility through roads, abatement of flooding and submerged houses, among others in those formally labeled slums. This study focused on formal residential areas where the Government of Lagos State could ascertain her provision of waste management facilities and waste carting services, yet the MSWM practices remained unsustainable.

It is acclaimed that the rate of population growth of Lagos is about 10 times faster than that of New York and Los Angeles, the USA (LSG, 2020). Lagos being one of the fastest growing cities in Africa (WEF, 2016) is said to generate about 13,000 tonnes of solid waste per day (Sanusi, 2018) without considering those indiscriminately disposed and does not reach the approved dumpsites.

Ojowuro et al. (2018) in their characterization study of Lagos metropolis municipal solid wastes from residential land use type stated that the highest percentage of waste is the organic component that was between 33.06 – 46.25%. Next to this, was plastic waste that composed of 12.73 – 20.70%, followed by paper waste, 4.61 – 10.30%. Oyelola and Babatunde (2008) in their study claimed that the components of households' solid waste stream were 68.16% of putrescible waste, 12.46% of paper, 7.68% of nylon, 4.2% of garden waste/grit, 3.64% of plastic, 2.08% of metal and 1.78% of glass. According to British Plastics Federation (2020), nylons are a group of plastics known as polyamides. With this in mind, it is inferable that the total percentage of plastic in this study stands at 11.32%. The pie chart representative of the finding is as shown in Figure 1.1.

Figure 1.1

Lagos Metropolis Waste Composition by Percentage



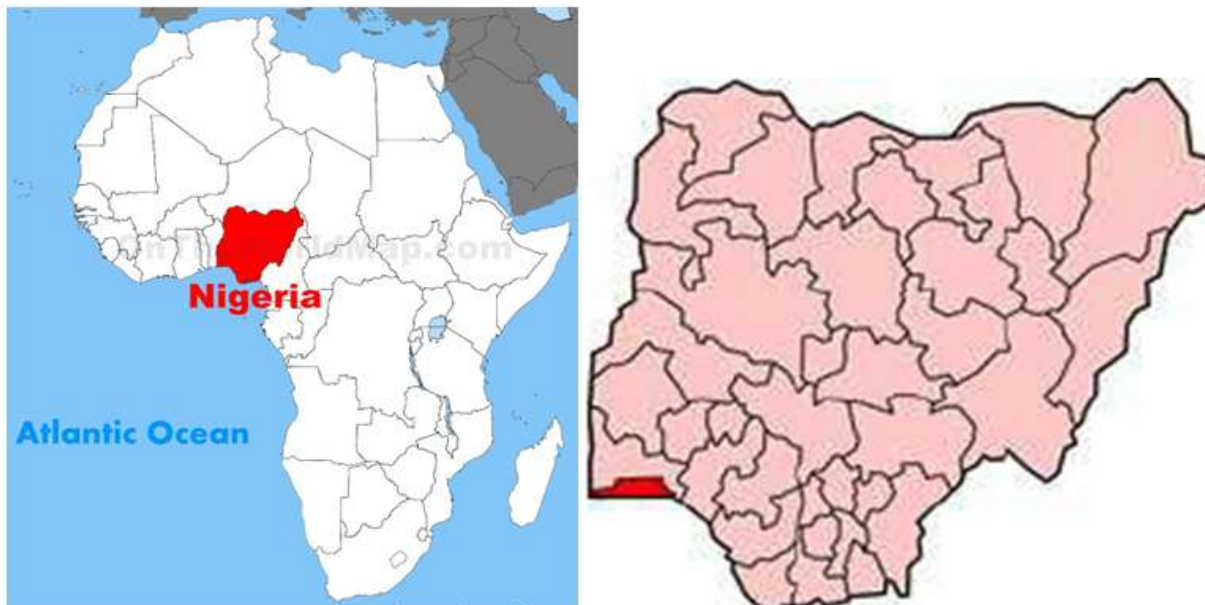
Note. Adapted from *Characterization of domestic and market solid wastes at source in Lagos metropolis, Lagos, Nigeria*, Oyelola & Babatunde, 2008.

Figure 1.2 shows Nigeria's position in the map of Africa and the location of Lagos within the map of Nigeria. Lagos is bordered from the southern region by the Atlantic Ocean where the majority of bodies of water in Lagos with their washed – off land – based wastes/debris empty

into. This could be the possible route through which Lagos is said to contribute to the pollution of the ocean with plastic wastes (Dumbili, 2020).

Figure 1.2

Map of Africa showing the Location of Nigeria and that of Nigeria Showing Location of Lagos State in Red Colours



Note. Adapted from Exploration and agriculture in crude-oil producing communities of Ondo State, Nigeria: Challenges and diversification Strategies, Apata et al., 2020; Physiochemical assessment of landfill generated leachates in Lagos, Nigeria, Akujieze & Idehai, 2014.

Lagos is the commercial nerve centre and the economic powerhouse of Nigeria's economy as it contributes 62% to the national non – oil GDP. The Vision for Lagos is that by 2025 it will be: 'Africa's Model Megacity and Global, Economic and Financial Hub that is Safe, Secure, Functional and Productive' which is aimed to be achieved through Poverty Eradication and Sustainable Economic Growth through Infrastructural Renewal and Development. One of the developmental pillars earmarked towards achieving the set vision 2025 is the 'Sustainable Environmental Pillar' that focuses on the following areas: drainage and flood control, solid waste management, sanitation, pollution, the built environment and

environmental management and climate change (MEPB, 2012). The aforementioned areas have remained sources of major concerns in the State.

Problem Definition

The severity of problems associated with the extant linear metabolism of plastic *vis-à-vis* plastic production, consumption and plastic waste management in Lagos, Nigeria have become more visually alarming than ever (Figure 1.3). Despite the usefulness of plastics in our day – to – day life, the end – of – life of plastic factually constitutes great hell of nuisances (Alabi et al., 2019; Thompson et al., 2009) as a result of unsustainable poor life cycle considerations in production, improper consumption behaviour and management of the high persistent waste arising from its usage (Kehinde et al., 2020). A simple glance round the metropolis gives enough evidence that the practiced linear economy of plastic in the state is unsustainable (Agberemi, 2020) with its attendant adverse effects, ecologically, socially and economically.

Evidently, drainages are clogged with plastic waste, storm water forced away from the blocked drainage to the road and becoming point of destruction to the streets/roads/ways; the streets and open lands are littered with plastics of all sort (Alabi et al., 2019). These problems have resulted from the general mismanagement of solid waste generated and the non – biodegradability characteristics of plastic waste (Agberemi, 2020). Municipal solid wastes are majorly generated by households and the leakages/indiscriminate dumping of these wastes are perpetrated by households.

According to World Bank (2019), the establishment of appropriate waste management system to allow for the globally acceptable management of the generated municipal solid waste is essential in order to build livable and sustainable cities. However, for many cities in most developing nations, achieving that had remained a challenge. It is no longer news that municipal solid waste management in Lagos is posing major concerns (Figure 1.3 & 1.4) that

have defied many efforts put in place to transit from the unfriendly and unsustainable management to a sustainable one (Adenaike & Omotosho, 2020; Ayantoyinbo & Adepoju, 2018).

Plastic waste is among the fast-growing waste types in the general waste stream in Lagos (Godfrey, 2019). Lagos is acclaimed to be highest generator of plastic waste by volume in Nigeria (Adekomaya & Ojo, 2016). The plastic waste generation is expected to triple in some couple of years to come if no effort is made positively in redirecting the waste to economic fortunes and possibly contribute to the economic enhancement of the nation (Adekomaya & Ojo, 2016).

The management approach currently obtainable at the study area neglected the major generators of municipal solid waste – which are the households. The neglect of these primary generators of municipal solid waste is thought of to be one possible reason why previous efforts to sustainably manage solid/plastic waste in the city of Lagos could have failed. Most of the previously proffered and implemented solutions to solve this social phenomenon were not usually based on systematically researched information neither were the major stakeholders carried along in the planning. It is believed that a better angle towards finding a lasting solution to this problem of plastic waste is to properly study, to know how the major generators of this component of municipal solid waste have contributed to hindering the sought – after sustainable management of plastic waste. Along the research line, the households' opinions, attitudes, culture, perceptions, toward sustainable waste management of plastic will be known amongst others and how best the households could be made to play sustainable management roles could be deduced using the concept of circular economy in order to achieve set research purposes.

Figure 1.3

Plastic Waste Floating on different Open Drainage Channels in Lagos



Note. Self – taken photograph

Figure 1.4

Plastic Waste dug out from an Underground Storm – water Tunnel, Lagos



Note. Plastic waste dug out from an underground storm – water tunnel, Lagos

WEMPCO Road (Self – taken photograph)

Purpose of the Study, Research Aims, and Objectives

Purpose of the Study

The purpose of this mixed methods research (Almalki, 2016; Doyle et al., 2009) is to investigate into how the households have contributed to the extant unsustainable solid waste management and contribute towards deciphering how they could be integrated into the

sustainable SWM system to minimize plastic waste leakages toward achieving sustainable plastic waste management in Lagos, Nigeria. Plastic pollution is a pressing global environmental concern (Karasik et al., 2020; Dutta & Choudhury, 2018) as can be inferred from the 2019 theme for the World Environment Day that was captioned “Beat Plastic Pollution” (UNEP, 2018). Locally, plastic waste pollution in the study area is at an alarming stage (Dumbili & Henderson, 2020; Kehinde et al., 2020; Elenwo & Akankali, 2015); hence the need to contribute towards finding a lasting solution to this unsustainable management of plastic waste in the city of Lagos (Babayemi et al., 2018).

To be successful with the system strategic planning, thinking and the integration of the three sustainable development dimensions, the citizen’s participation is very crucial (Onu et al., 2012). Thus, in order for Lagos to successfully transit to sustainable solid waste management, the citizens needed to be carried along right from the planning stages. Without proper researched information, the opinions, perceptions attitudes, cultural beliefs, etc. of the citizens towards sustainable management of solid waste (e.g., plastic) will not be known and where that is the case, improper planning will ensue, resulting in failure of the programme. To avoid this type of ‘dead on arrival’ programmes/projects, research of this nature is needed with focus on the households who are the major generators of municipal solid waste in the Lagos metropolis.

Research Aims

The study applied the mixed explanatory sequential research design (Almalki, 2016) to help gather necessary information that could lead to the formulation of sustainable solid/plastic waste management policy that will see to the reduction of the quantity of plastic waste in the households’ waste stream and the proper management of the unavoidable ones in Lagos, Nigeria.

Research Objectives

The research objectives are:

To critically examine and understand the opinions, perceptions, attitudes, behaviours of households regarding solid waste management.

To establish how the households have contributed to the current scenario of having unsustainable management of plastic waste and why they manage plastic waste the way they are doing.

To determine how the households could be integrated into solid waste management system to play some roles that could help in achieving sustainable plastic waste management in the State.

To find out the way plastic recyclers are organized and what challenges have hindered the ultimate plastic recycling in Lagos, Nigeria.

To establish through desktop research, comparable scenarios and plastic waste management situations using other yard sticks or international best practices aimed at policy learning, transfer, adaptation and adoption.

Nature of the Study

The study on the contemporary social phenomenon was carried out in its natural setting as it occurs, no manipulation was carried out on the research participants, or any process of the study. Purposive sampling was carried out in some quarters with the aim of getting some specific information (Mohajan, 2018) that only some few correspondents might be privileged to have. The data capturing process relied on survey snapshot using structured questionnaire (quantitative) and, on face – to – face interview in order to retrieve in – depth information from respondents and enable the digging deeper into some emerging knowledge (qualitative). The foregoing, is indicative of research rooted in the interpretive framework of pragmatism (LeCompte & Schensul, 1999). The use of structured questions in questionnaire with pre – fixed answers is related to quantitative research approach rooted in the paradigm of positivism (Cheung, 2021). The later strand of data gathering is an indication of a research tilting to a

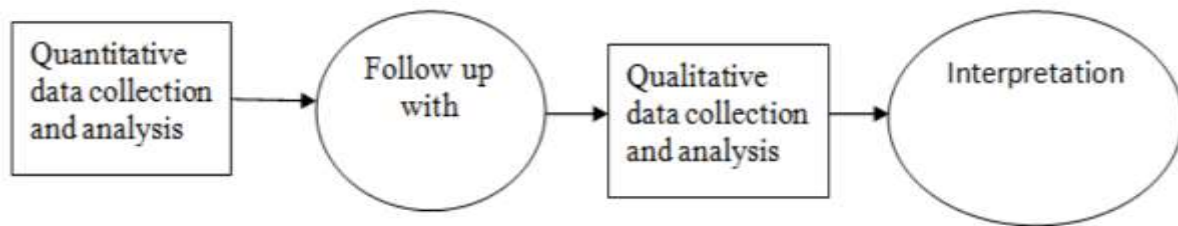
qualitative case study (Baxter & Jack, 2008) that is rooted in the philosophical worldview of interpretivism (cf. Kivunja & Kuyini, 2017).

According to Draper (2004), specific research questions have to be matched with a befitting research design in order not to undermine the quality of the research project. In order to critically examine the opinions, attitudes, beliefs of the populace towards plastic waste management, a one – time survey was carried out using a structured questionnaire to help establish baseline information (Glasow, 2005). The involvement of qualitative and quantitative research methods in a single study is referred to as mixed methods research approach.

Mixed Methods

The mixed methods research approach entailed the triangulation of data collection and data analysis. The research design was the mixed explanatory sequential design that entailed the use of qualitative research to facilitate results of the initial quantitative findings. The initial data collection was quantitative by way of survey through the administration of questionnaires with structured questions to find out the perceptions, behaviours, opinions, attitudes of the sampled population on plastic waste management amongst others. The result from this quantitative strand was used in preparation of the qualitative phase of the study. On the issue of when to apply mixed explanatory sequential design, Creswell (2014) asserted that, it is necessary when one wants to get a thorough understanding of the data, the researcher may use qualitative data strand as a follow – up in order to get better grasp of the quantitative database as may have been obtained through a survey.

Data collection in the second strand of the research was done through interviews with semi-structured and unstructured interview schedules in interviews with individuals and Focus Group Discussions (Kabir, 2016). Figure 1.5 depicts the explanatory sequential design with an initial strand of quantitative process followed by a qualitative section.

Figure 1.5*Explanatory Sequential Design*

Note. Adapted from, *Explanatory sequential mixed method design as the third research community of knowledge claim*, Subedi, 2016.

Suitable Research Design: - Case Study

The research design suitable for the research is a ‘case study’ which is usually context specific (Hancock et al., 2007). The research looked at the case of municipal plastic waste management with focus on the role of households in aiding the transition to sustainable management of municipal plastic waste in Lagos. The study population was treated as one entity. To be a case study, it has to be ‘system bounded’ – with clear research objectives, be specific concerning the focus and the scope of the study (Kumar, 2011; Creswell, 2007). Baxter and Jack (2008, p.545) stated that a case study become preferred: (a) where the research questions have to do with how and why; (b) where and when the behaviour of study participants will not and cannot be staged or manipulated in the course of retrieving the study data; (c) where the researcher wants to study specific conditions or situation on the premise that the studied contextual conditions will be helpful in understanding the phenomenon of study; or (d) where a clear boundaries between the phenomenon and the context cannot be easily established.

Case study can either be qualitative or quantitative but in most cases, they are predominantly qualitative like the case at hand that was carried out in real – life setting (Jackson-II et al., 2007). Case study research could be used for in – depth investigation of

contemporary phenomenon in real – life context (Yin, 2009). To adequately retrieve in – depth data on the phenomenon of interest, appropriate data collection tools must be selected.

Data Collection Tool

Data collection is the series of activities carried out in order to retrieve information on certain parameters or the variables of interest, in a recognized and acceptable systematic pattern that enables the researcher or interviewer to answer set research questions, test hypotheses, and evaluate outcomes (Al Hammadi, 2021; Kabir, 2016, p.202). Data can be collected in two broad categories of quantitative or qualitative form and can be collected from primary or secondary sources. In existence are several methods/tools for collecting data in research process while the emphasis remains in assuring accurate and honest data collection.

The main purpose of the study is to help to contribute to deciphering how best the households could be incorporated in the sustainable plastic waste management programme to play certain roles that could aid the transitioning process. Atieno (2009) claimed that the way the purpose of a study points to the research questions, while the research questions on its part determines the applicable method, so does the method inform the type of data that should be collected.

With the above antecedents, the best data collection tools to appropriately answer the research questions will be through a more human – to – human interactive data collection process as provided by ‘interviews’ of various types whilst other necessary information was sourced through one – time survey and secondarily. From interviews, phenomenon under study could be interpreted based on the meanings that the respondents bring to the study (Alshenqeeti, 2014).

Analysis that can be adopted for the Research Study

Methods of analysis of interview data are not fixed in literature, though, there is recommendation on the need for researchers to be careful with methods applied in order not to

erode the nitty – gritty of interview content (Kaye, 2020; Alshenqeeti, 2014). Data gathered from the quantitative strand was analyzed by the performance of simple descriptive statistical analysis (Kumar, 2011) using Microsoft Excel Sheet and IBM Statistical Package for the Social Sciences (IBM – SPSS). However, the majority of the analysis was qualitative content analysis of interview data. The aim of doing qualitative content analysis is basically about the transformation of huge amount of text to a compact and well-organized summary of the fundamental results (Erlingsson & Brysiewicz, 2017). In this regard, the interview contents were analysed so as to identify the major themes originating from the respondents or from the notes taken at the field (Kumar, 2011).

Significance of the Study

Generally, the policy guiding the solid waste management practice in the study area is basically focused more on the removal of waste from the neighbourhood of the living environment to be deposited in designated dumpsites (un – engineered landfills) without provisions for treatment or recovery of re – useable or recyclable materials (Salami et al., 2018). If the plastic wastes were managed with principles of sustainability management and tenets of the Circular Economy, there is the potential of adding to societal prosperity growth (cf. Adekomaya & Ojo, 2016). The study looked at the plastic waste management situation using the concept of circular economy as a guiding framework in finding out how the practice is going contrary to these sustainable management practices and to decipher how these practices can be re – aligned to a more sustainable form. While the Transition Management Theory principles was used to guide the recommended transitioning process. Studies along the line of plastic waste management in the study area have not used the Circular Economy concept and the Transition Management Theory as guiding frameworks to generate information that could be used for ‘evidence – based policy formulation in an effort to bring to an end, the menaces

caused by extant plastic waste management practice in the study area and enhance economic growth.

According to World Economic Forum (2016), the Circular Economy of resources/materials has the tendency of enhancing societal economic growth as well as the reduction on the demand for the earth's finite and virgin resources. Proper application of the Circular Economy concept has a way of decoupling economic growth from environmental pollutions. In order not to remain lock – in to the socio – technical syndrome of unsustainable management of plastic waste, it is necessary that these types of studies are carried out to provide ideas to policy – makers on how best the society can be freed from the lock – in syndrome and proffer waste management practices that will bring about the achievement of social, economic and ecological benefits.

The research will use its findings in advocating for change of the systems towards a plastic circular economy where there will be prioritized rethinking of what should be put in the Lagos markets and also make efforts to increase our ability to keep the used plastics in the loop (cf. Ellen MacArthur Foundation, 2020). Going by the nuisances constituted by used plastics and the increase in its use in Lagos, it is evident that there is a need for change from the current linear plastic economy that generates waste by design to the type that considers the possibility of value preservation and the benefits of plastics whilst ensuring that the observed drawbacks of the current system is eliminated (Crippa et al., 2019). Part of the information needed to bring about the above in the study area will be retrieved from the intended study and how to go about the implementation of possible recommendations will be drawn from the study.

Research Questions/Hypotheses

Relevant tentative research questions (tentative then, for the fact that there is the possibility of accommodating some emerging research questions as one gets more familiar with the research (Langkos, 2014) that could be helpful in achieving the purposes of the research) are as follows:

Specific Research Questions

What are the challenges of the households in attempts to sustainably manage household generated plastic waste?

How have solid waste management/regulatory bodies made effort to sustainably manage plastic waste in Lagos and why have they not achieved tangible results?

Main Research Questions

RQ1. What opinions, attitudes, culture, beliefs, practice and so forth do the households have towards sustainable solid/plastic waste management in Lagos?

RQ2. How have the households managed municipal solid waste that could either have contributed to hindering or aiding the transitioning process to sustainable solid waste management in Lagos, Nigeria?

RQ3. How can the households be integrated in the value chain of solid waste management to play some sustainability management roles that could aid transitioning to sustainable plastic waste management in the study area?

RQ4. Which strategies have been successfully applied for some other megacities/countries of near characteristics with Lagos in the management of plastic waste?

RQ5. How can some of these strategies (identified in RQ4) be adopted and adapted to suit the Lagos/Nigeria context?

Hypotheses

Following the idea of gathering the opinions, belief, and practices of the study population, it was envisaged that there should be some specific trend with respect to the extant solid waste management practice within the metropolis. Stratifying the study area into HI, MI, and LI areas will lead to assessing or determining some specificities of different socio – economic strata and accordingly, the following hypotheses were raised:

H1. Respondents in HI areas are more concerned with the wellbeing of their environment

H2. High-Income dwellers are more compliant in the containerization of household waste

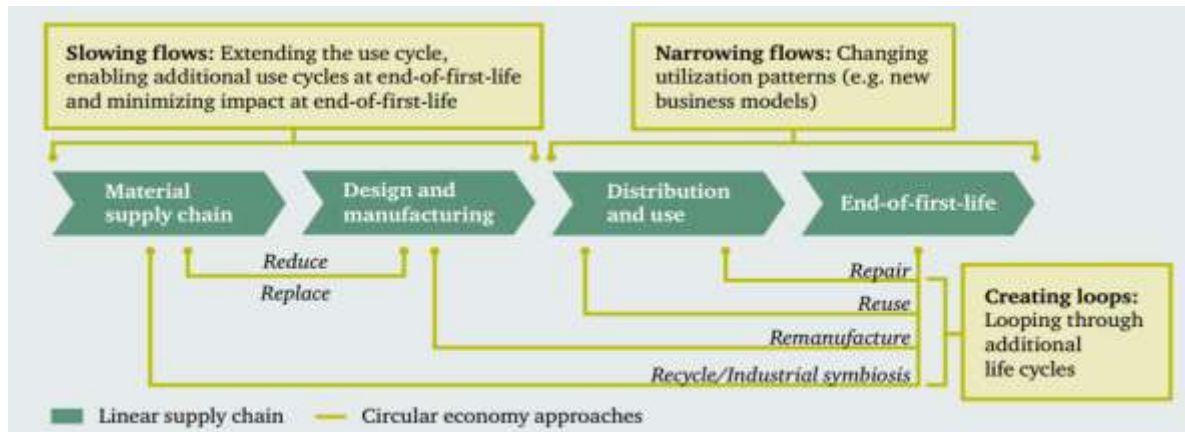
- H3.** The willingness to pay for waste service charges is more prevalent in the HI areas
- H4.** Low-Income dwellers are less concerned on the need to better manage plastic waste in the metropolis
- H5.** The more educated the respondents, the higher the acknowledgement of the inherent value of plastic waste.

Conceptual Framework

Concept of Circular Economy

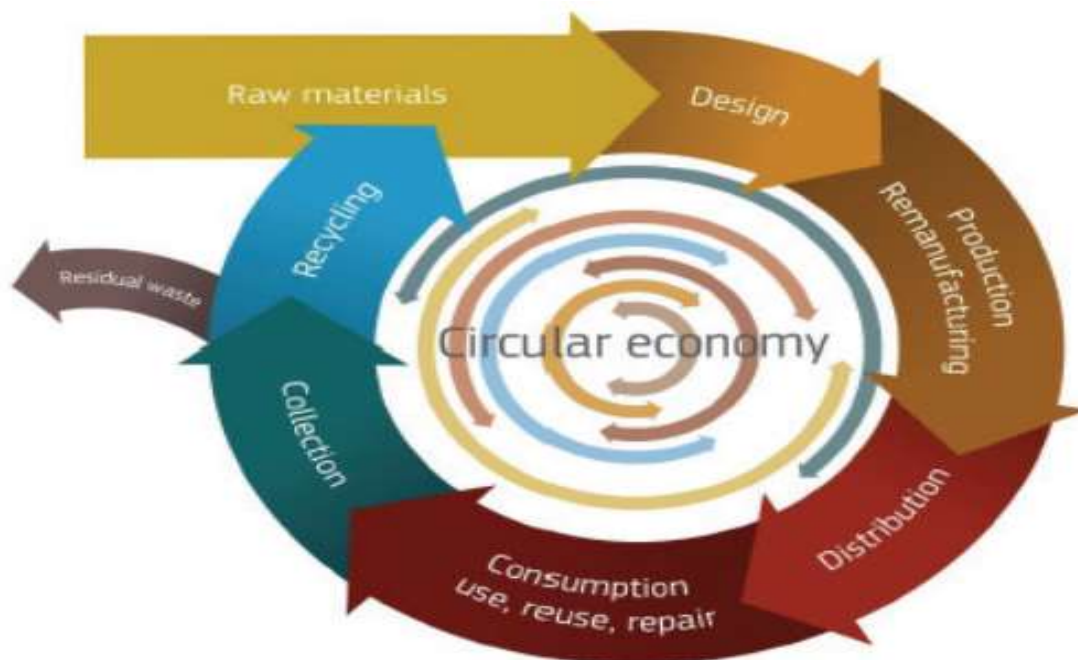
Circular Economy (CE) is an economic concept that bears resemblance with the concept of Sustainable Development (SD). Some scholars have asserted that the SD initiatives were implemented within the urban linear metabolism thinking where virgin resources are extracted away from urban centres, but used and the wastes are dumped in the urban area to the detriment of the environment and the society: leading to unsustainable management of resource as being observed with plastic waste in Lagos (Dumbili & Henderson, 2020). The observed lapses with extant/current plastic waste management practice could be covered with implementation of the concept of CE that advocates for loop closing (Barra et al., 2018). Accordingly, Valavanidis (2018) stated that the concept of circular economy can become a very useful tool to proffer solutions in situation where sustainable development is seen to have failed as a result of the implementation of linear economy model of production.

CE is mimicry of natural pattern of a healthy ecosystem metabolism where supposed end – of – life of a material serves as raw material for another process. Preston et al. (2019) definition of CE summarized it as one where recycling of products takes place as they are repaired and reused instead of being thrown away; it ensures that wastes from certain processes are used as feedstock for other processes and they depicted the activities in CE as shown in Figure 1.6.

Figure 1.6*Linear and Circular Economy activities*

Note. Adapted from *An inclusive circular economy priorities for developing countries*, Preston et al., 2018.

The circular economy diagrams in its circular shape as the name implies is as depicted by Mrowiec (2018) in figure 1.7.

Figure 1.7*Diagram of Circular Economy*

Note. Adapted from *Plastics in the circular economy (CE)*, Mrowiec, 2018.

The goal of CE is the creation of closed loop, basically to eliminate all resource leakages out of the system (Geissdoerfer et al., 2016) by shift from linear to circular urban metabolism where materials at end – of – life are harvested and fed – in as raw material for another process (Leusbrock et al., 2015). In summarizing the goals usually aimed at when circular economy concept is integrated in the plastic sector, Barra et al. (2018) stated that it helps to increase the reuse of plastic material, making material recycling processes more economically viable, reduce plastic waste leakages from the waste management system into the natural environment, such as the bodies of water, open land, gorges, roads, among others. It also enhances the decoupling of plastic production from the consumption of fossil fuel and the use of renewal resources on the stead of fossil – based feedstocks.

Plastic sector problem redemption through circular economy looks into alternative production process like that from non – fossil fuel as feedstock or use of plastic waste. It advocates for the redesigning of the manufacturing process such that the following are put into consideration: the longevity enhancement, reusability improvement, how plastic waste generation can be prevented. The concept encourages collaboration among consumers, businesses and waste management regulatory authorities to advance recycling and add to the value of plastic products. The concept also looks at how robust information can be made available to aid circular solutions policies as well as provision of regulatory measures that could support circular economy implementation in the focused sector (Barra et al., 2018). Following the circular economy concept, local sustainability initiatives could play very important roles in the sustainable management of plastic waste by the application of the Circular Economy concept to attain greater sustainable development level in the long – run (UNDP, 2019).

It is claimed that some of the reasons why the concept of the Circular Economy is not yet adopted along the line of solid waste management by most African countries is the lack of necessary knowledge on implementation process and the absence of researched information

(Ezeudu & Ezeudu, 2019). This research will be guided by the tenets of the Circular Economy principles to produce information that could support policy makers to formulate and implement policies that will contribute to the transition from linear plastic economy to circular economy in Lagos, Nigeria. Ezeudu and Ezeudu (2019) asserted that there are available evidences showing that in communities, local government levels, nations or sectors where CE has been properly implemented, there are lot of benefits existing therein.

CHAPTER 2: LITERATURE REVIEW

Waste management challenges have bedevilled Lagos for many decades; hence Lagos has been identified to be having difficulty managing the ever – increasing amount of solid waste generated by the inhabitants (Ayodeji et al., 2021; Abila & Kantola, 2020; Chinedu et al., 2018; Amuda et al., 2014; Adewole, 2009). It was claimed that the situation resulted from the rapid industrialization, uncontrolled population growth, lack of appropriate policy and the implementation of existing ones (Aliu et al., 2014). To combat the situation, several regimes of the Lagos State Governments have made reforms in the waste management sector (De – Gramont, 2015). Past and present administrations of the State have always shown interest to transit to a more globally acceptable sustainable solid waste management practices with limited progress (Abila & Kantola, 2013). A society is perceived to be in a socio – technical lock – in, where there is the realization that extant culture, technology applied or pattern of addressing a specific issue (e.g., solid waste management in Lagos) is not good or that there is need for urgent improvement, but yet remained entrap in the wrong practice (Nwosu & Chukwueloka, 2020; Oluwole, 2005). However, despite the realization and the desire for the change, the society finds it difficult to exit from the adjudged faulty practices (Silvestri et al., 2015). Therefore, this persistent or wicked problem indicates the need for sustainability transitioning (Lazo & Gasparatos, 2019).

Due to the dynamic nature of persistent and wicked environmental problems, it is advocated that such problems should be handled accordingly based on already drawn – out principles and concepts, putting into consideration the socio – cultural and economic context of the society (Parrot, 2017; Duckett et al., 2016). For the research problems at hand, the management of the transition process needs to be given the treatment that it deserves in the pursuance of success (Schilling et al., 2018) since it requires societal changes that will entail structure and cultural change to effect change on practice towards sustainability management of the phenomenon in question. This needed societal change in practices does not require a

command – and – control system of government approach to tackle (Kemp & Loorbach, 2006) as it seems prevalent in the developing nations. Hence, the study applied the theoretical framework of Transition Management Theory (TMT) and Circular Economy (CE) concept of plastic in an effort to establish lasting solutions to the most visible stream of solid waste – plastic waste challenges in Lagos, Nigeria.

The Theoretical Framework and Industry Field

The Theoretical Framework

Theory has been defined differently within and across several disciplines (Thomas, 2017). Hence, there is no consensus on the definition of the word ‘theory’; though its importance in scholarly research is highly accepted (Rasmussen, 2017; Udo – Akang, 2012). Scholarly studies are aimed at adding to knowledge in the research discipline/area and theory helps the researchers to place names on salient observations made in the research, giving understanding and possible explanations to human interaction as may be related to the study phenomenon (Kivunja, 2018).

However, an appealing definition that may relate well with this study was that by Kerlinger and Lee (2000) defining a theory to be a set of concepts, preposition or definitions that bears relationship with one another that portrays a general opinion of incidents, phenomena, or episodes among others by defining the relationships that exist among various variables with the aim of giving possible explanation for the phenomenon as well as its predictions.

The theoretical framework put together theories that experts have advanced in a particular field of study. This field of study has correlation with where the new researcher plans to carry out his/her study and has the intention to draw information from. This is done in order to get theoretical background for the analysis of gathered data and make sense of information therein through the interpretation of results (Kivunja, 2018). The theoretical framework is synonymous with the ‘blueprint’ for the total enquiry that will be made in a specific dissertation

(Adom et al., 2018; Grant & Osanloo, 2014). The theoretical framework for research has been simply posited to be the frame that is capable of holding the theory of a study (Swanson & Chermack, 2013).

The theoretical framework of a study is the structure that sums up theories and concepts that were developed as a result of formerly/formally tested, reviewed, accepted and published knowledge. The knowledge, leads to building up on existing information, in order to secure a theoretical basis for analysis of data and their interpretations, in order to construct meaning of inherent information from the correspondent(s). The theoretical framework is about what the experts in the field of research hold and have done in relation to the proposed research. Furthermore, it is about what significant contributors state concerning the research area that individual research may intend to delve into; and that the researcher will use to better understand gathered data (Kivunja, 2018). Kivunja (2018) further related the theoretical framework to mean what the experts in that field said beforehand concerning the researchers' research questions with respect to the research problem(s) and in some cases, the solutions proffered as strategies of solving the problems. Inferably, the theoretical framework can be equated to be a specialized lens that can be used to analyze data, interpret findings, discuss and draw conclusions with possible recommendations.

Importance of the Theoretical Framework to a Scholarly Qualitative Research

Research findings situated appropriately in theoretical frameworks help in the provision of rigour and skills that are of high demand in scholarly studies at higher educational levels. It contributes to generating meaning out of the collected data in the study. It is also useful for critical examination of the proffered solutions to the problem at hand as well as in the evaluation of recommendations put forward (Lederman & Lederman, 2015). The structure that the theoretical framework provides guides the researcher in defining the research philosophically, method – wise, and analytically. When it comes to arguing for or against a

specific finding or stance, the theoretical framework becomes useful in substantiation as it may help in the justification of claims made and the findings. As a research blue print, it helps to guide the research in almost its entirety (Passey, 2020; Adom et al., 2018; Kivunja, 2018; Grant & Osanloo, 2014).

Right Choice of the Theoretical Framework for a Study

Research by Jambeck et al. (2015) showed that Nigeria was listed as ninth in the world and second in Africa among countries that mismanage plastic waste significantly. The mismanagement of solid waste or precisely, leakage of plastic waste into the environment is about human behaviour (Godfrey, 2019). To sustainably manage plastic waste in such areas will have to involve behavioural changes. Furthermore, humans are known to find it difficult to change their behaviour to learn and embrace the adaptation and to utilize new technologies. Resistance to change associated with finding solutions to wicked and complex societal problems has been known to be handled through the application of the principles underlining the Transition Management Theory (Rotmans & Loorbach, 2009), hence this study investigated this further.

Transition Management Theory (TMT)

Problems of plastic waste mismanagement in Lagos, Nigeria are a complex and a persistent environmental problem. The problem arises from human behaviour (Godfrey, 2019) that is profoundly engrossed in the societal structures and they are difficult to manage as diverse actors with varied interests are concerned. Such problems are associated with system failures that are lock – in to defects in the societal structures. Correcting the system failures will need societal systems' restructuring; succinctly put as a 'transition' (Rotmans & Loorbach, 2009).

A transition can be viewed to be a gradual but continual process of change that involves societal transformation resulting from change in structural character of the society. Rotmans et al. (2001) described transition as the series of changes that are connected to each other and they

have the ability to influence and reinforce each other. These changes may occur at different areas of the society such as the economy sector, sphere of technology, the belief systems, guiding institutions, practices, culture, ecology, among others. As a multi – dimensional phenomenon that has several dynamic layers, for a transition to take place, numerous improvements must be made simultaneously in several fields/areas (Rotmans et al., 2001). Since the problem is complex in nature with unpredictable uncertainty associated with it, such societal changes cannot be managed by command – and – control mechanism (government) but rather through governance (Kemp & Loorbach, 2006).

The Transition Management Theory is about the managing of societal transformation processes. The discourse of TMT is centred on how it can be used to establish and guide the transformational processes in the direction that it is needed by carrying out short – term actions aimed at the achievement of sustainable state in the long run over a long – term (Kemp, 2007). Transition Management Theory principles have emphasis on system innovation that might have its origin from front runners within or outside the regime. It encourages the idea of learning – by – doing and doing – by – learning as it will involve a lot of uncertainty prevalent with complex system change (Kemp, 2007; Loorbach & Rotmans, 2010). Transition Management Theory is one of the theories that give insight to transitioning processes surrounding socio – technological systems' changes; indicating how such changes could be managed to achieve long – term sought sustainability goals (Forrest & Wiek, 2014).

One of the indicators of an unsustainable society is the existence of complex and persistent problems (Kemp & Loorbach, 2006). Several efforts made by various regimes to the present State Government concerning plastic waste management in the study area are an indication of problems acknowledgement and the need to transit to better sustainable management options as sought. However, since the society is lock – in to this flawed socio – technical structure, communities are finding it difficult to break free from it. TMT proffers

ideas on how the breakthrough could be achieved with ecological, social and economic benefits (Schilling et al., 2018; Kemp & Loorbach, 2006). Sustainability transitions are geared towards the establishment of a better sustainable system state (Schilling et al., 2018; Wittmayer, 2016).

Transition Management Theory (TMT) has been applied in order to assist in achieving gradual societal transformation in a reflexive manner through directed processes of variation and selection. These guided variations and selections allow for gradual advancement with a new pattern of operations as observations show deviation from the traditional pattern that was unsustainable. Identifying these variations and selecting the most appropriate variation to be guided can help the communities to free themselves from erroneous practices and technologies by giving room for co – evolutionary steering as has been shown in the waste and energy management transition in developed countries such as the Netherlands where TMT originated (Spaargaren et al., 2012; Kemp et al., 2007).

In order to attain the minimal globally acceptable plastic waste management practice, the extant plastic waste management practices in the study area will have to change and become sustainable. This transition needs to be guided and managed well and this can be achieved by applying the TMT tenets knowing well the scientific knowledge of the dynamics of modern societal changes (Spaargaren et al., 2012). The theory in conjunction with the Circular Economy concept guides efforts to gather the necessary information from the correspondents and other research works. Furthermore, knowing what should be asked the correspondents was be guided by the theories, hence the filtration of responses and, the method of information retrievals was inclined to the theoretical frameworks.

Criticism of Transition Management

Criticism towards the Transition Management Theory has to do with the seemingly obvious neglect of matter of power; to guide the transition in the right direction, where certain actors must spearhead it and pertinent on this matter also is the question about whose behalf

these actors will act (Shove & Walker, 2007). Silvestri et al. (2018, p.5) asserted that, the application of Transition Management Theory to complex environmental problems do not always guaranty the achievement of sustainability objectives.

The Transition Management Theory has been criticized for not specifically differentiating the standard (normative) content of sustainability transitions and seems to have ignored the idea of individuals who engage in the process of transition (Rauschmayer et al., 2013).

The Circular Economy (CE)

The Circular Economy (CE) concept can be viewed as a variant of the sustainable development concept with the central aims of decoupling industrial development/production, economic growth and consumption from environmental damages. It is a shift to ultimate value creation practices with attendant economic, social and environmental benefits (Fogarassy & Finger, 2020). The CE concept is a trending research area and it has been shown to have been used to replace the traditional linear metabolism of resources (Adenaike & Omotosho, 2020) that results in severe adverse effects in almost all ramifications of life. The global acceptance of the underlying concept of sustainable development has been claimed to be the driver behind the rapid acceptance of CE in areas where it is already in use and other areas where efforts are being made to adopt it (Ezeudu & Ezeudu, 2019).

In some quarters however, it was claimed that the initiatives inherent with sustainable development were executed in line with the thinking surrounding linear metabolism of resources that has shown to be unsustainable because of the finite nature of natural resources (Ezeudu & Ezeudu, 2019). In this case, the natural resources are harvested from the hinterland, brought to urban areas for use and the resulting wastes are dumped, mostly untreated with consequent economic, social, and environmental adverse effects. The foregoing gives a similar picture of what is happening with plastic production, its use and the plastic waste management

in Lagos, Nigeria (Dumbili & Henderson, 2020). With only about 40% waste collection average for developing countries, in view of the Nigerian case, the solid waste management processes and programmes leave a lot of room for waste leakages into the environment (Adeniran & Oyemade, 2016). Waste leakage to the environment is an indication of unsustainable solid waste management practices and with the current knowledge, this practice can be replaced by applying the guiding principles of the CE of plastic (Fogarassy & Finger, 2020; Ezeudu & Ezeudu, 2019; Godfrey, 2019). The Circular Economy concept is one of the most highly placed and discussed political agenda in Europe that is currently being looked upon to further enhance economic growth with environmental decoupling effects (Kalmykova et al., 2017). Developing countries are currently making effort to implement it, especially in the sphere of solid waste management (Preston et al., 2019).

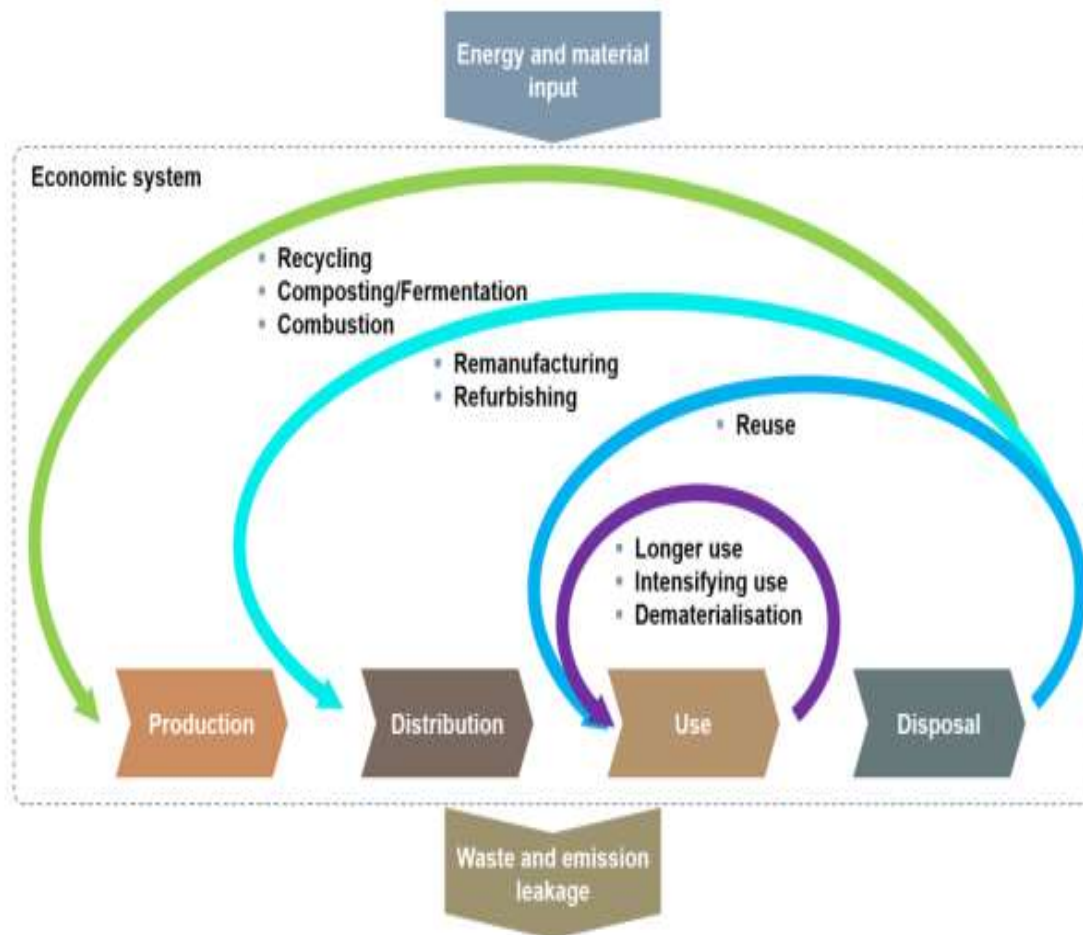
The failures associated with the effort to implement sustainable development with the mindset of linear metabolism can be closed through the application of the CE concept – the circularity of resources metabolism. The concept advocates that in order to meet the need of the future generations (Mbah & Nzeadibe, 2016), radical transformation from the extant pattern of natural resources utilization is very necessary. Barra et al. (2018) asserted that waste leakages to the environment can be brought to the barest minimum by the closing of the loop, where a waste in one sector becomes a raw material for another in aiming for creation and optimization along the value chain. Accordingly, Valavandis (2018) surmised that the Circular Economy concept is a useful tool for proffering workable solutions where the implementation of sustainable development ideologies was applied to production in a linear economy system that have shown signs of failure.

The Circular Economy follows the thinking line of industrial ecology, cradle – to – cradle, amongst other similar concepts, though with a more regenerative system at play. According to Preston et al. (2019), CE involves the recycling of products, reuse instead of

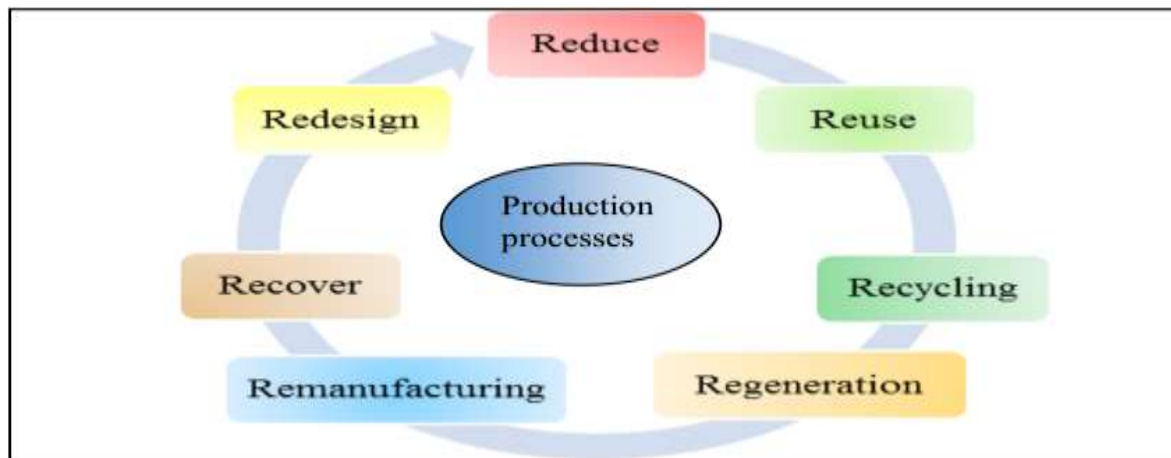
outright throw – away, so that the supposed waste from a process becomes an input for another process (Valenzuela & Böhm, 2017). CE tries to imitate a healthy natural ecosystem metabolism where the end – of – life of plant/animal/substances go into another process as raw materials in a way of continual circulation (see Figure 2.0).

Figure 2.0

Loop Closing Sample in Circular Economy thinking



Note. Adapted from *Circular business models: A review*, Geissdoerfer et al., 2020.

Figure 2.3*The Rule of 7R in Closed – loop System*

Note. Adapted from *Circular economy - Foundation of challenges for business environment*

Dobrota et al., 2017.

One of the major aims of this study is to get information that could be helpful in the formulation of sustainable plastic waste management policy, that, if well implemented in the study area will minimize plastic waste in the household's waste stream with the avoidances of leakages. Also, even where plastic waste is unavoidably generated, it will be well managed since the manufacturers must have factored in the Circular Economy – thinking in their production processes. Ultimately, attainment of sustainable management of plastic is sought through the implementation of the principles of the Circular Economy concepts with the transition being guided by the Transition Management Theory's tenets. Circular Economy is about the elimination of resource leakage by the creation of a closed loop within the value chain of a resource (Geissdoerfer et al., 2016); thus, a shift from linear metabolism to circular metabolism where the concept of urban harvest is applied to turn the supposed wastes into new feedstock (Valenzuela & Böhm, 2017; Leusbrock et al., 2015). According to Barra et al. (2018) and Mwanza (2018), where CE principles are integrated into the plastic sector, it enhances the economic benefits of plastic recycling and reuses, minimize plastic waste leakages from the value management chain; reduce the current plastic waste littering; decouple plastic production

processes from the earth's finite fossil fuel reserves as renewable feedstock is given priority for use.

To be able to solve the problem of plastic waste using the concept of circular economy, numerous stakeholders must be involved and everyone must play their part according to circularity thinking. Alternative production in terms of the use of non – fossil feedstock may need to be considered and redesigning of production processes that consciously consider the following; improvement in the longevity of plastic products, enhancement of reusability, recyclability of the product by initiating the elimination of substances that could hinder recycling of specific plastic products, possible ways to prevent plastic waste generation from their use, among others. Barra et al. (2018) stated that the proponents of the concept also put effort to see how useful information can be made available to enhance the visibility of circular solutions' policies and ensure that provisions are made to regulate and support intended implementation on sectors of focus.

According to Preston et al. (2019), it is paramount that the developing countries take the implementation of the Circular Economy concepts as a priority to advance economic growth and at the same time reduce their ecological footprints. However, it has been claimed in some quarters that the Circular Economy implementation is not being integrated in the majority of the African countries as expected for some reasons of the lack of necessary information on how to go about it, as well as the paucity of research findings aimed towards the implementation of CE (Ezeudu & Ezeudu, 2019; Lazo & Gasparatos, 2019).

The tenets of the Circular Economy concept were applied as a guide in drawing necessary information that the policy makers could find useful for the formulation of the policies necessary to transit to sustainable management of plastic waste in Lagos, Nigeria. Transition processes could also be guided by TMT where governance rather than government principles will be used to rightly guide the transition against the extant command – and –

control ideologies. Ezeudu and Ezeudu (2019, p.2) asserted that, where the Circular Economy concepts have been adopted and well implemented, there are shown evidences that many benefits abound in the sector, community, sub – nations and the nations at large. The adoption of the Circular Economy concept to manage plastic production, usage and sustainable management after the first – end – of – life of plastic products (Mwanza, 2018) will result in wealth creation as observed in the previous studies (Kehinde et al., 2020).

Challenges of the Circular Economy Concept

Though circularity presents a promising option as the way forward for the future, it is not without challenge, especially when it comes to the implementation. For instance, where life cycles and industries are integrated, the possibility of this leading to complex systems are high which can hinder healthy competitions that might consequently heighten economic vulnerability to disruptions (Ucqbva, 2014).

Industry Field

As can be deduced from the foregoing, the researcher's mindset is inclined towards environmental sociology; applying standard sociological research methods to gather and analyze data in order to contribute towards solving societal environmental problems.

Literature Review in Research Dissertation

Introduction

The processes involved in the literature review are complex; yet, it is a great necessity for good research outcomes at higher educational levels (Snyder, 2019). It has also been rated as one of the most important stages in the research process, irrespective of the research methodology applied (Onwuegbuzie et al., 2012). The word 'review' means to sight critically, scrutinize, view, examine, among others, more than twice (Grant & Booth, 2009). Randolph (2009) defined literature review as, an academic exercise that involves analysis and synthesis of information in literature, summarizing the inherent substances to draw conclusions on

specific or near – similar research topic. Onwuegbuzie et al. (2010, as cited in Onwuegbuzie et al., 2012) defined literature review to be a mental representation of a group of published or unpublished or a combination of both sets of documents gathered from different sources on a specific or related topics that basically concerned the critical analyses, evaluation, and summarization of the documents.

The Purpose of Conducting Literature Review in the Research Process

Carrying out literature review in a specific field of endeavour can help to show the extent of knowledge that the researcher has concerning the field of study. It enhances one's knowledge of relevant theories, vocabularies, major variables, etc. The conduct of literature review broadens the research knowledge regarding erudite researchers and a group of researchers in that field: those that matter in that field of study (Randolph, 2009). It gives a snapshot of the major themes affiliated with the topic, showing where possible consensus and disagreements that may exist in scholarly works. It is useful in the establishment of the relationships that exist between ideas and practices as well as to determine the differences between literature and observations. The activity also helps in answering some of the research questions arising from the research problems (Randolph, 2009; Hart, 1998; Gall et al., 1996).

Brief on Research Problem

Plastic waste problem is a global concern (Abdel – Shafy & Mansour, 2018) and one needs not to wonder why the theme for World Environment Day (WED), 2018 was captioned 'Beat Plastic Pollution' (Farooq et al., 2018). Locally in Lagos, Nigeria, the extant unsustainable plastic waste management crisis is practically so glaring that the attendant adverse effects socially, economically and ecologically are better imagined. The State Government has in the past proffered and implemented some measures to curb the problems but to no avail (Adenaike & Omotosho, 2020). The majority of the proffered and implemented initiatives have failed to solve the problems (Adekomaya & Ojo, 2016). In some quarters, it

was alleged that the previous solutions were not based on systematically researched information. More so, the major stakeholders were neglected throughout the planning phase(s) while the command – and – control system of administration was applied in the implementation of proffered management programmes (Onu et al., 2012). Plastic waste leakages from management value chain are as a result of behavioural and societal structure which must be handled from such point of view, to find lasting solutions (Godfrey, 2019). Households are the major generators of municipal solid waste (Rai et al., 2019) that usually contain major fractions of plastic; hence attempt to resolve the leakages and plastic waste mismanagement must include the households and householders (Noufal et al., 2020). The obligation to ensure that generated waste is properly given the right treatment lies first on the generator of the waste (UNEP, 2015). On this premise, the research was planned to investigate the roles that the households played in extant plastic waste mismanagement and that which they could play to enhance sustainability transitioning in plastic waste management in the megacity of Lagos, Nigeria.

It is believed that a better angle towards finding a lasting solution to this problem of plastic waste is to properly study, to know how the major generators and first handlers of this component of municipal solid waste have contributed to hindering the sought sustainable management of plastic waste (Abila & Kantola, 2020; Jouhara et al., 2017). Along the study line, the household's opinions, attitudes, culture, perceptions, practice, etc., toward sustainable management of plastic waste was determined amongst others. Furthermore, how best the households could be made to play sustainable management roles could be deduced in order to achieve set research purposes. Thus, certain research questions were raised with Transition Management Theory (TMT) and Circular Economy (CE) concept (Shin et al., 2020; Horvath et al., 2018) as guiding frameworks.

The Relationship between Research Question and Literature Review

Part of the raised research questions could be answered through literature review and maybe classed as literature review questions while other sections are better answered empirically. The literature review's question section guides in determining the literature review to be undertaken (Randolph, 2009). In this regard, Rowley and Slack (2004) stated that, literature review could be viewed as a succinct excerpt of a subject area that has a way of supporting the possibility of the identification of particular research question(s). The identified research questions in turn will determine the extent to which the literature review will be carried out and the matters that needed to be reviewed (Torraco, 2016). In the process of doing literature review, information from different sources needs to be drawn from academic works, books, professional journal/articles, government directives and gazettes, files, and web – based resources, among others (Rowley & Slack, 2004).

Torraco (2016) pointed out five (5) major purposes of doing literature review which are (a) to scrutinize, evaluate, upgrade/update, and for the critiquing of the literature; (b) to administer meta – analysis of the literature; (c) for the synthesis of the literature; (d) for topic reconceptualization; and (e) to answer specific research questions as may be related to the topic under review in the literature.

Organization and Structure of the Literature Review

The structuring of literature review helps to give credence and consistency to the review outcomes. In order for the review to be done in an orderly manner with a clarity of purpose, the topic needs to have precise conceptual structuring, such that the major concepts could round – up, combining into amalgamated ideas. A clear conceptual structure determines how the literature review is organized (Torraco, 2016). There are three types of structure that may be applied in literature reviewing, which are, a methodological structure, temporal structure and conceptual/thematic structure (Torraco, 2016). Temporal structure takes up reviews based on the topic's historical development in a chronological pattern with timeline of the origin of topic

in focus. Methodological structure gathers literature for review based on similarities of applied methods and can be useful to the study topic that different methods were used in the study (Torraco, 2016). On the other hand, the conceptual or thematic structure is presented according to concepts and theoretical frameworks of the paper/articles/research (Torraco, 2016).

Based on the three stated structures, the conceptual or thematic literature review seems more aligned to the current study. The study is centred on the concept of households, the Circular Economy concept that is substantiated on sustainable development and the Transition Management Theory as frameworks to guide the research inquiries. In the same vein, these concepts on this topic formed the bases upon which the review was organized to provide the needed coherency and clarity of purpose (cf. Tarraco, 2016; Randolph, 2009). The review focused on topics around households' involvement in solid waste management, transitioning to sustainable plastic waste management through behavioural changes, barrier to sustainability transitioning, solid/plastic waste management through governance rather than the government, circular economy of plastics, formal and informal plastic waste management in study area, etc. This review structure will therefore involve a flow of related ideas from literature to provide a unified idea.

Assemblage of Resources for information in Literature Review

In order to carry – out secondary data collection, efforts were put in place to ensure that representative sets of articles connected to the topic were collected. Just as in the conduct of primary research, so it is expected to be with secondary data collection, a systematic plan must be devised for the data collections with proper recording and documentation of articles used (Randolph, 2009). The process of data collection was initiated by searching the internet of academic databases for articles with similar or near – similar topics, related to sustainable solid waste management, plastic waste management with sustainability transitioning, Circular Economy of plastic, plastic waste governance, among others. From the articles that were found

useful, their references were looked into to select seemingly relevant ones to the study. This was repeated severally until the information saturation point was reached (cf. Randolph, 2009).

General Solid Waste Management

Definition of Waste

The meaning of the term ‘waste’ has different connotations and is a very broad concept (Pongrácz & Pohjola, 2003). Waste is defined as material that the owner desires to discard or has no more need for (perceived to have no economic value), at that particular time, (Ogbodo, 2009) and is useless to the producer/generator (Amasuomo & Baird, 2016). However, Ogbodo (2009) pointed out that by defining waste as something useless or that is of no economic value, that certain important aspect of waste has been omitted, in that, waste does have economic value and it can be utilized by another process outside the original owner/generator or generating process. Pongrácz and Pohjola (2003) surmised that for waste to be sustainably managed there is a need to redefine waste. Waste may be unwanted by the owner as a result of it being in excess of what the holder needed as at the time of wanting to dispose it. Solid waste is also called trash or garbage which might include packaging materials, clothing, electric appliances, batteries, furniture, garden waste such as leaves and other plant parts in smaller sizes, such as grass clippings (Ugwu et al., 2020; Bello et al., 2016).

UNEP (2015, p.22) observed that waste arises as a result of the assemblage of four major wrongs. These four wrongs were mentioned to be; the emergence of a wrong substance(s) from human activities, the substance in wrong quality, being at the wrong place, and at the wrong time (Conlon, 2020). The activities of man generate materials that could be solid, liquid or gas and immediately these generated materials are unwanted by the generators, they become waste to the generator. In order to do away with these wastes, the air, water and land are usually the major environmental media that they can end – up being located, legally or illegally. Generally, waste are residues of processes (Singh et al., 2014), things that are no

longer useful for that process and may need to be thrown away (UNEP, 2015). As there are several processes, so there are different sorts of waste and waste types (Ogbodo, 2009). The waste in focus for this research work is solid waste; within the solid waste, the Municipal Solid Waste (MSW) is of concern while precisely speaking, municipal plastic waste is central to the study.

Solid Waste Management

Waste management is one of the major utility services that are a crucial element of infrastructure that predicates a society. It is supposed to be one of the top national agendas and discussions at international level. However, in some countries, it seems not to be considered as a top priority that needs maximum attention (Wilson & Velis, 2015).

Proper waste management is very key towards the achievement of goals of sustainable development (UNEP, 2015). The global acceptable waste management trend is to see the entire world transitioning from the linear waste management economy associated with end – of – pipe waste management approach to the Circular Economy (UNEP, 2015) of waste management with its attendant integrated and sustainable resource management practices (UNEP, 2015; Wilson & Velis, 2015). The latter makes economic, health and ecological positive sense at the societal levels where it is properly implemented.

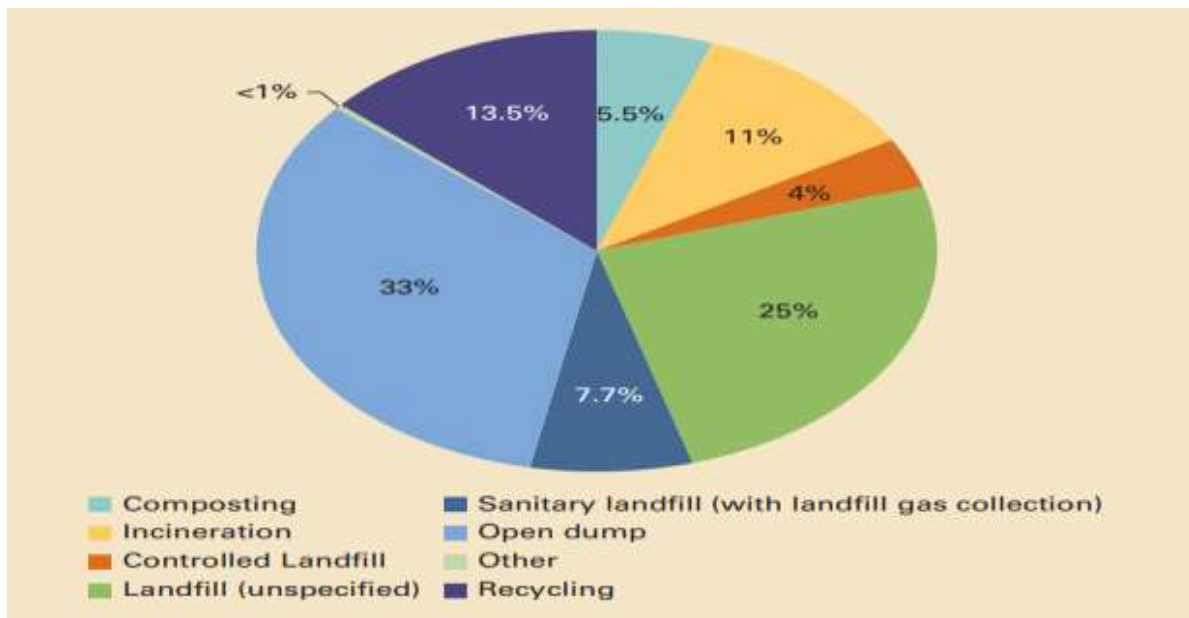
Waste management is a cross – cutting issue with many facets of the society as it is linked to a wide range of other global issues bedevilling the world, such as climate change, health matters, resources insecurity/management, poverty reduction, consumption patterns, and sustainable production, among others (US – EPA, 2020).

The Global Waste Management Outlook (GWMO) (United Nations Environment Programme, & International Waste Management Association, 2015) surmised that in the 21st century, waste management is still a global challenge to the developing and developed nations of the world (Abdel – Shafy & Mansour, 2018), that it will need not only the local effort to

overcome but a concerted international effort to reach sustainable processes of waste management. It is estimated that, approximately 2 billion people do not have access to regular waste collection (Singh et al., 2014) while about 3 billion people worldwide do not have the opportunity to controlled disposal services for municipal solid waste. This is a pointer to the fact that this environmental concern needs a globally co – ordinated resolution (UNEP, 2015; Singh et al., 2014) and should not be left to the locals alone (Singh et al., 2014).

Figure 2.4

Global Waste Treatment and Disposal



Note. Adapted from *What a waste 2.0: A global snapshot of solid waste management to 2050*, Kaza et al., 2018.

Kaza et al. (2018) shows global waste treatment and disposal (Figure 2.4) and it can be deduced from this that a lot needs to be done globally concerning the extant waste management practices as isolated cases of best practices in very few places cannot solve the mismanagement elsewhere (Singh et al., 2014). The Figure 2.4 shows that open dumping is the major worldwide practice of waste management as corroborated by Hoang and Fogarassy (2020).

Current Trends in Solid Waste Management in Cities of Developing Countries

Developing countries are experiencing massive migration from rural communities to the major cities. This is not only peculiar to the African continent as Manzi (2016) reported that the migration to cities in Central America is enormous that the region was said to have been rated second in the world in urbanization and the average growth rate was estimated to be 3.8% in the last two (2) decades. Generally speaking, an increase in population of a given city will mean an increase in the generation of municipal solid waste (Hoang & Fogarassy, 2020; Singh et al., 2014). Where unplanned explosion in population takes place in cities of developing nations, the inefficient and epileptic waste management structure is made bare to the public as a result of inability to collect solid waste which are often indiscriminately dumped in public and open spaces (Ali et al., 2014). The proper management of municipal solid waste in cities has been used by many as an indicator of how well or otherwise the urban reformation programmes are going. For some long times, the delivery of public services has been failing in most cities of the Southern hemisphere. One of such services is the management of municipal solid wastes in the cities (Bello et al., 2016; UNEP, 2015).

Apart from massive migration to cities resulting in the unprecedented surging in the volume of waste generated (Lavagnolo, 2018), globalization was also fingered since it is on record that it alters peoples' consumptions patterns and their use of solid materials which in the end will lead to the generation of larger volumes of waste (Bello et al., 2016). Major cities in developing nations are now contending with the task of managing the ever – increasing amount of generated waste to curtail the adverse consequences connected with inappropriate solid waste management. “Solid waste is a by – product of a consumer – based economic lifestyle, which is actually more concentrated in urban areas” (Lavagnolo, 2018, p.774). Between 20% - 50% of total budget are expended on solid waste collection yet the entire waste or areas are not fully captured (Hoang & Fogarassy, 2020). As a result, poor waste management is experienced by the city dwellers who somehow contribute to the problem by indiscriminately

dumping waste in public places and on water bodies. These actions further worsen the sanitation situation that was nothing good to write home about beforehand.

History has it that waste was never a threat or an issue of much concern universally until the surge in urban population that saw generated waste piling – up and unattended to, while unhealthy odour/stench filled the atmosphere; the seepages contaminated water bodies and water supplies. The outbreak of plagues in 1340 in Western Europe as well as in some areas in the northern part of Africa was surmised to have resulted from the mismanagement of waste or as a result of inaction in managing the generated urban waste. This ‘black death’ as the phenomenon was referred to, led to the loss of life of around seventy – five million individuals worldwide. In order to avoid continual outbreaks and the spread of diseases, waste management techniques were conceived. The system of cradle – to – cradle was adopted, involving material reuse and recycling, livestock feeding with vegetable waste while others were used as fertilizers and some were repeatedly used in construction (Bello et al., 2016).

The industrial revolution of the 18th century, where rapid developments of trade, product innovation, acquisition of skill and in the era of development of machinery in western countries led to the need to properly address waste management challenges through collection, transportation and disposal to designated sites (which are usually situated at the outskirts of cities). This time in some quarters has been referred to as the sanitation age where the desire to maintain public health was mainly the focus (Bello et al., 2016). By 1900, quite a portion of the developed world such as the United States of America (Sengupta & Agrahari, 2017) and Europe already developed standard waste management programmes with appropriate technologies and instituted apparatus to further promote good health and wellbeing (Bello et al., 2016).

Based on the reasons for managing waste in the era of colonization, African cities had efficient waste management systems as they were introduced by the colonial masters who also

ensured that the waste were regularly collected and disposed at designated areas. The waste management agenda then was geared towards aesthetics, sanitation and health protection. It was asserted that up to early 1960s, Africa was having adequately acceptable waste management levels as the population was low and resources were available to averagely take care of the waste from the populace. Unfortunately, bequests left by the colonial masters were not sustained by some countries after their independence, resulting to a fall in the capabilities to efficiently manage generated waste (Bello et al., 2016).

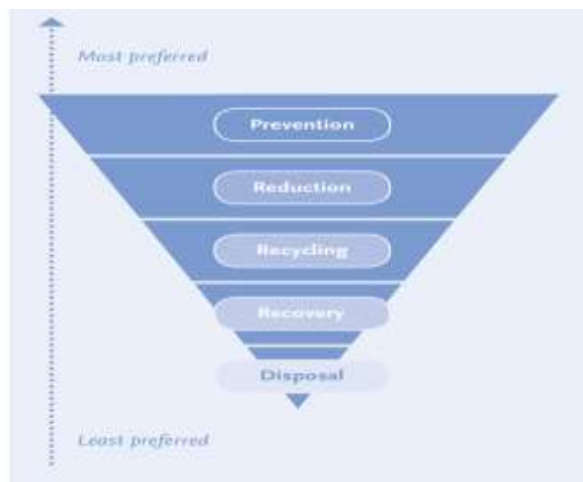
Best waste management practices that are globally acceptable are no longer focused more on waste collection but on how the generations of wastes could be prevented. The end – of – pipe waste management approach is being abandoned for waste generation preventive approaches and the sustainable management of any unavoidable waste generated thereafter (Bartl, 2014). To this end, Singh et al. (2014) stated that in order to properly manage waste, there is current agitation for change from the end – of – pipe approach to the practice that prioritizes the prevention of waste generation and the management of resources in a sustainable manner.

There is no ‘one size fits all’ in a waste management approach that can be used in managing different materials or for treating all waste streams. As such, based on their peculiar waste streams, local authorities are advised to create waste management plans fashioned towards meeting their specific needs in the context of the area (UNEP, 2015). In a broader term and in recognition of the immediate past, the solid waste management hierarchy was developed which is a form of ranking system to deal with solid waste. The waste management ladder is referred to in some scholarly articles as Lansink’s ladder and it is claimed to be one of the outstanding frameworks for waste circularity with its innovation bases in all facets of material and product chains (Lansink, 2018).

This waste management ladder provides waste management strategies with the least preferred strategy at the lowest rung of the ladder; least preferred in that, it is the lowest ranked environment – friendly strategy (US-EPA, 2020; UNEP, 2013). UNEP (2013) and U.S. EPA (2020) presented the waste management hierarchy as depicted in Figure 2.5 (A and B respectively).

Figure 2.5

Solid Waste Management Hierarchy



A (UNEP, 2013)



B (U.S. EPA, 2020)

Note. Adapted from (a) *Guidelines for national waste management strategies: moving from challenges to opportunities* UNEP, 2013; (b) *Best practices for solid waste management: A guide for decision-makers in developing countries and places emphasis on reducing, reusing, and recycling* U.S. EPA, 2020.

Most cities in developed countries are already practicing the strategy on the most preferred rung of the waste management ladder with advances in the implementation of the Circular Economy concept in waste management in line with circular business models (Hoang & Fogarassy, 2020). However, most cities in the developing countries are still implementing the strategy at the lowest rung, which is waste collection and disposal to landfills (Lavagnolo, 2018). Hoang and Fogarassy (2020) stated that land filling is the method mostly used

worldwide for disposing solid waste. However, Lavagnolo (2018) asserted that there are four major models or classification in the use of land filling which are rated according to their environmental friendliness and these are, open dumping, controlled land filling, engineered landfill and sanitary land filling as briefly explained as follows:

Open Dumping Approach: This is the least environment friendly of all; said to be the crude stage in landfill that features as the name implies, freewill dumping with little or no measures put in place in order to control operations. The limited control or no control extends even to the social, economic, and ecological implications arising from the dumping practices and scavenging activities (Lavagnolo, 2020). In some quarters, it is simply referred to as dumpsites rather than landfills (Ogunrinola & Adepegba, 2012).

Controlled Landfill: It is the initial step taken in the upgrading of a dumpsite towards being a landfill. Here, concerted effort is made to put nuisance's characteristics of open dump to a minimum level. Reduction in nuisances may involve, odour reduction, vermin control, dust management and avoiding birds to the site. Apart from these, apparatus of inspection is constituted, incoming waste are recorded towards having some parameters of interest, waste compaction is done, tipping front are controlled while dumped surfaces are regularly capped with soil as cover (Lavagnolo, 2018). However, liners are not installed that could have enabled an efficient leachate collection system and treatment of collected leachate (UNEP, 2018).

Engineered Landfill: In an engineered landfill, concerted efforts are made to bring environmental impacts to a minimum level beyond that which is obtainable with a controlled landfill site by the application of more stringent measures towards environmental protection. Liners are installed to direct leachate to pond (Lavagnolo, 2018).

Sanitary Landfill: In sanitary landfills, maximum measures are put in place to avoid environmental, social, and health adverse effects. Steps start by ensuring that site is chosen based on set parameters, vermin is controlled at a maximum, landfill gas extractors installed

and the gas is collected for utilization, arising leachate is treated, daily capping carried out after each days' job or coverage done after certain levels of dumping. Sanitary landfill sites are expected to have closure and aftercare plans (Lavagnolo, 2018; UNEP, 2018).

These stages of waste dumping are depicted in Table 2.1 with arrows indicating progression towards preferred dumping in solid waste management.

Table 2.1

Classification of Waste Dumping and Progression towards Sustainable Management

Flying-tipping “indiscriminate” dumping	or	Open or uncontrolled dumping	Controlled disposal	Sanitary engineered landfilling
Waste is deliberately, often illegally dumped in open spaces in cities, towns, rural areas or rivers		Waste is indiscriminately deposited at a designated site with either no, or at best very limited measures to control the operation and to protect the surrounding environment	is a designated site, which has access control, cover and compaction, but no liners, leachate collection systems, etc.	Waste is deposited in an engineered, controlled facility, designed and operated to minimize impacts. Includes, e.g. liners, leachate collection systems, and landfill gas recovery

Progression in the management of waste 

Note. Adapted from *Africa waste management outlook*, UNEP, 2018, p. 15.

It has been claimed that 54% of the world population lived in cities in 2014 and that by 2050, an estimated 66% will be living in the cities around the world (UNDESA, 2014).

However, for the Americas, 80% are already living in the cities, for Europe and Oceania, about 70% while for Africa and Asia, only about 40% and 48% live in the cities respectively (UNDESA, 2014). Since most developed areas of the world already have high percentage of people living in the urban areas, then the beehive of the projected rise of those migrating to cities will come from Africa and Asia. In 1990, ten megacities were recorded in the world, of which 5 were from developing nations, but as at 2014, it increased to 28 megacities. Record has it that 16 of the 18 new entrants are from developing nations and it is forecasted that by 2030, about 66 megacities will exist worldwide. One of the implications of the aforementioned is that municipal solid waste generation will double come 2030 in Africa and Asia major cities (Wilson & Velis, 2014). It is surmised that waste recycling in developing countries is majorly done by the informal sector with about 20% - 30% recycling rate (Wilson & Velis, 2014; Wilson et al., 2013). Sequel to the foregoing, Wilson and Velis (2014) concluded that the waste management problem that most cities in the developing nation will remain focus on the basic antecedences of aesthetic concerns, public health and environmental protection. Hence, waste collection system must try to extend their scope of coverage to ensure that even those living in peri – urban areas and slums are captured in order to do away with uncontrolled municipal solid waste disposals.

The majority of solid waste management activities in most cities in developing countries are centred on the collection and disposal to dumpsites. On the continent of Africa, it is claimed that the average waste collection is 55% of generated waste, although collection rates differ considerably from one location to another (Niekerk & Wegmann, 2018). Composition of the generated MSW differs from country to country and even within a country as many factors influences the waste streams.

Solid Waste Characterization

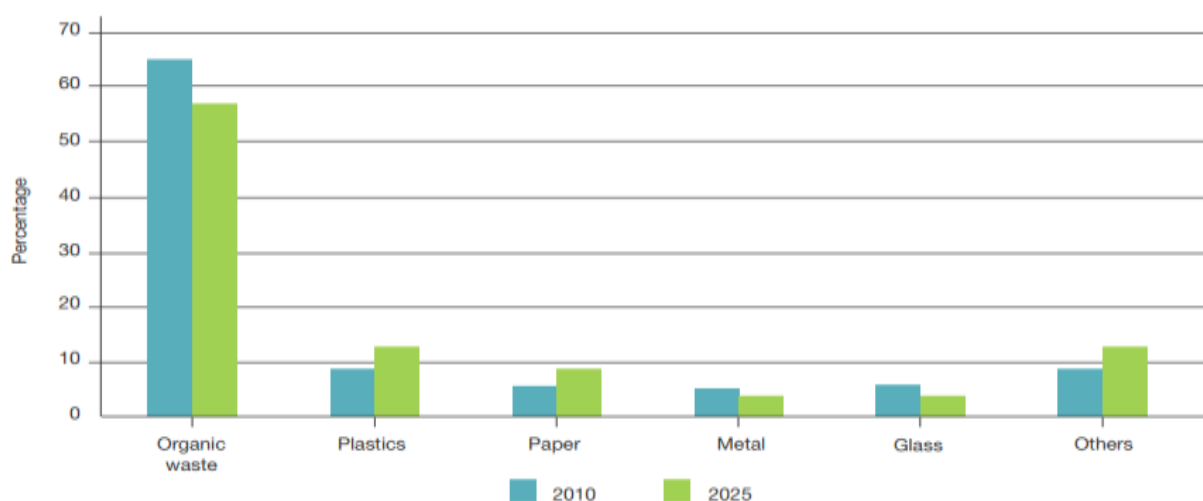
One proffered approach for developing nations for the management of municipal solid waste is the Integrated Solid Waste Management (ISWM) approach that is holistic, multidisciplinary, and a multi – dimensional system of waste management (Abdoli et al., 2016). It is a solid waste management system that encompasses major steps geared at reducing the municipal solid waste challenges through waste generation prevention, waste separation, collection, transportation, composting, waste to energy, recycling, treatment, and disposal with concerted efforts geared towards resource maximization and efficient use in an integrated manner (Ugwu, 2020; McDougall et al., 2003). To really plan towards this system of sustainable waste management, the components of the waste stream need to be known (Mugo et al., 2016) as different materials may require different treatment in the ISWM approach (Ugwu, 2020). The process of determining the components/compositions of a whole waste stream is referred to as waste characterization or waste auditing (Konya et al., 2013); although the methods of application may differ.

As the quantity of waste generated per capita differs from one country to another, so does the composition of waste itself. The composition of solid waste depends on many factors such as lifestyle of the population, weather, geographical location, economic development/social status, cultural belief, consumption pattern, among others (Mugo et al., 2016). Any attempt towards sustainable waste management plans for a particular location must place the context into consideration, hence the waste to be managed needs to be characterized to have an idea of how best the management plans could be executed to suit the local context. By characterizing waste, it becomes easier to know how the collection will be done, what kind of transportation equipment will be better, which designs will be most proper for treatment while factoring in or recognizing the available funds (Ugwu et al., 2020; Konya et al., 2013). It is stated that the composition of waste is changing fast; hence the previous method of

management may not be applicable after some years. UNEP (2018) projected the possible changes on waste composition between 2010 and 2025 for some African cities (see Figure 2.6).

Figure 2.6

The Projected Changing Composition of Wastes in African Cities

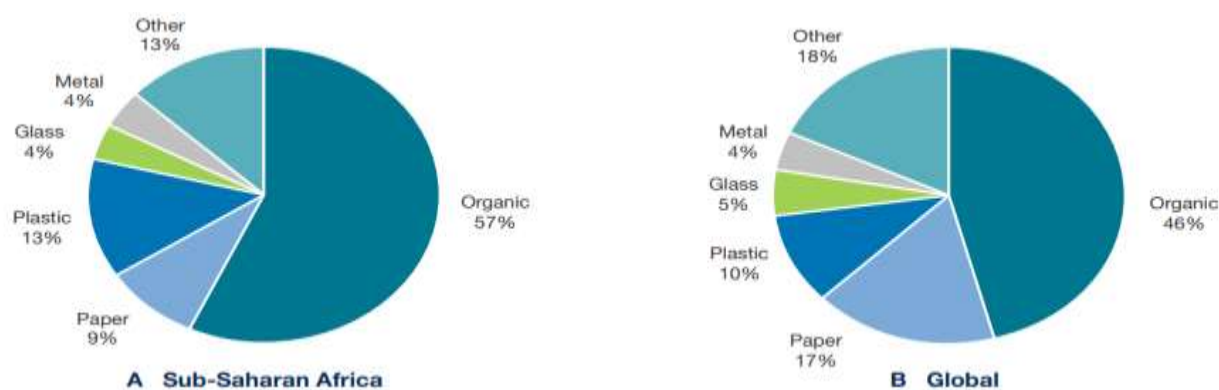


Note. Africa waste management outlook, UNEP, 2018.

UNEP (2018) also showed a comparison of the composition of municipal solid waste for Sub – Saharan Africa and that of the global composition as depicted in Figure 2.7. Sub – Saharan Africa waste composition has over 10% organic waste than the global levels and a higher plastic content.

Figure 2.7

MSW composition of sub-Saharan Africa and the global world



Note. Adapted from Africa waste management outlook, UNEP, 2018

Table 2.2*Municipal Solid Waste Composition of some Selected African Cities*

City	Composition (percentage)						Reference
	Organic	Paper/ card - board	Plastic	Glass	Metal	Others	
Kampala, Uganda	77.2	8.3	9.5	1.3	0.3	3.4	Bello et al., 2016
Dar es Salaam, Tanzania	71.0	9.0	9.0	4.0	3.0	4.0	Bello et al., 2016
Ibadan, Nigeria	69.6	7.67	4.47	2.00	1.65	14.6	Adeyi & Adeyemi (in press)
Accra, Ghana	65.0	6.0	3.5	3.0	2.5	20.0	Oten-Ababio et al., 2013
Moshi, Tanzania	65.0	9.0	9.0	3.0	2.0	12.0	Bello et al., 2016
Sousse, Tunisia	65.0	9.0	9.0	3.0	2.0	11.0	UN-Habitat, 2010
Nairobi, Kenya	65.0	6.0	12.0	2.0	1.0	15.0	UN-Habitat, 2010
Lagos, Nigeria	62.6	10.7	4.2	2.5	2.2	19.7	Adeyi & Adeyemi (in press)
Abuja, Nigeria	56.3	11.4	10.2	3.9	5.2	N/A	Imam et al., 2008
Cairo, Egypt	55.0	18.0	8.0	3.0	4.0	12.0	UN-Habitat, 2010
Tshwane, South Africa	53.8	11.5	9.5	6.7	1.8	16.7	Komen et al., 2016
Windhoek, Namibia	48.0	15.0	11.0	14.0	4.0	8.0	Hartz & Smith, 2008
Average	62.8	10.1	8.3	4.0	2.5	12.4	

Note. Adapted from *Africa waste management outlook*, UNEP, 2018, p. 27.

Types of Solid Waste by Source

Classifications of wastes are usually carried out on the basis of their sources and the physical nature and according to how safe they are to the environment and living organisms. Source – based nomenclature may classify solid waste to be domestic or residential, commercial waste, medical waste, institutional waste, garden waste, public waste, construction/demolition waste, among others. Furthermore, others include hazardous and non – hazardous waste classes based on the potency to cause harm to the environment and living organisms (UNEP, 2018). Similarly, waste can be classified as a controlled and

harmful/toxic/special waste. Controlled wastes are those easy to manage, store or treat, such as, food waste, paper, plant clippings, plastics, etc. On the other hand, harmful wastes are dangerous to handle and these include mercury, acid, corrosive substances, among others (Ogbodo, 2009). Another form of waste type which is a growing concern in developing nations apart from plastic is the e – waste from electronic gadgets (Mugo et al., 2016). The waste type of concern is generated by households which in some cases are combined with waste from other sources within the community and regarded as municipal solid waste.

Municipal Solid Waste and Plastic Waste as a Central Focus

Different definitions of Municipal Solid Waste (MSW) exist from country to country, so what constitutes MSW may differ as well, however, most definitions have it that the majority of the waste is generated by households. Inclusive in this may be other look – alike waste that might have been generated from schools/institutions of government, commercial and industrial entities, public places, such as parks and gardens, roads, streets, markets, bus – stops, among others (UN – HABITAT, 2009). Residential wastes are generated from households by members of the household and this is in a continuous generation as long as activities are carried out in the context of consumption of products and use of other material items. Common to the residential wastes are farm produce, food products, paper, glasses, plastics, tins, clothes, e – wastes, metals, hazardous wastes that arise from aerosol sprays. Households are the highest generator of municipal solid waste in cities (Bello et al., 2016). As at 2016, it was estimated that the waste generated globally reached 2.01 billion tonnes and 12% of this amount were plastic waste (Kaza et al., 2018). MSW composition for Sub – Saharan African cities (see Figure 2.7) shows that the second largest waste specific component by weight was plastic waste and that is the principal waste of focus for this study.

The use of plastic products in the last five decades has being on the rise as a result of its reliability, ability to be moulded into any shape, it is light weighted, has high durability,

high resistance to corrosion, cheap and high affordability as a result of low cost of its production (Babayemi et al., 2019; Lebreton & Andrady, 2019). It is asserted that the global plastic production from virgin resource from 1950 to 2015 was 8300 million tonnes. Waste generated from this amount was estimated to be 6300 million tonnes; about 79% ended up at dumpsites/landfills around the world while about 12% was incinerated and 9% recycled. As at 2010, 32 million tonnes of plastic wastes were mismanaged worldwide (Babayemi et al., 2019) and production and consumption are projected to rise; this mismanaged amount will increase if it remains business as usual (Babayemi et al., 2019; Lebreton & Andrady, 2019; Kaza et al., 2018).

This mismanagement of plastic waste is a global treat to humanity and the environment, whilst not forgetting the socio – economic implications. The continent of Africa is said to have the highest percentage of mismanaged plastic waste. It also has the least state – of – the – art facilities for recycling (Babayemi et al., 2019). The cities in developing countries are the centres for dumping waste as urbanization is leading to an increase in population and subsequent generation of more waste.

Cities, Waste, Resources and Innovations

The linear metabolism of materials currently observed in the major cities in developing nations means that materials of great worth end up in the cities, hence linear business models leave the cities with environmental challenges of different sorts even as the depletion of the natural resource continues (Horvath et al., 2018). Only a few of these wastes are recycled while the majority end up at dumpsites. The cities are struggling on the management of the generated waste, but where the Circular Economy model is looked into, these wastes will be considered as resources and treated as resources to the benefit of the cities and the world in general (Horvath et al., 2018; Wilson & Velis, 2014). It is a known fact that, centres of innovation have been the cities for humanity and this power of creative imagination is of great need in order to

significantly manage the challenges of waste pollution in the cities (Wilson & Velis, 2014). Combining the accumulated waste/resources in the cities with human ingenuities in the cities, waste governance with application on context specific management plans, the materials formally treated as waste could become sources of wealth creation without environmental harm to the society (Horvath et al., 2018). Plastic waste is a major fraction of municipal solid waste that their presence in the cities in developing nations has become national and global concerns (Ortiz et al., 2020; Dutta & Choudhury, 2018).

Babayemi et al. (2019) asserted that, as the GDP of a place increases, so does the consumption of plastic. Similarly, the more the population increase, the higher the amount of the generated waste. Uncontrolled rapid urbanization is going on in the Asian and African continents as can be deduced from the emergence of megacities in the continents when compared to the others (Section 2.3.3).

Plastic production was claimed to have surged over the past five decades (Drzyzga & Prieto, 2018) and has increased by over twentyfold since the 60s as it reached 280 million tonnes in 2016. It is also estimated that of this amount produced till 2016, 79% of them till date lie in dumpsites/landfills or within the environment (Ortiz et al., 2020). The concern to adequately tackle the menaces of plastic waste is one of the priorities on the international agenda on waste management as is adduced from the latest meetings of the Conference of Parties to the Basel and Stockholm convention which rose with the conclusion that there is an urgent need to reduce plastic consumption and make certain that any generated plastic waste is soundly managed (Babayemi et al., 2019). One suggested strategy is the transitioning to the Circular Economy of plastic where plastic waste is taken for resources and returned back to the plastic's life cycle (Drzyzga & Prieto, 2018). Wilson and Velis (2015) stated that GWMO has shown some projects related to waste to wealth in Africa that has been used to better and develop the economy of some poorest cities in the world. A good example is that of a company

in Kenya (Alternative Energy Solutions) that claimed to be using about 16 tonnes of plastic waste per day for the production of synthetic oil; signaling the gradual transitioning to plastic Circular Economy (Horvath et al., 2018).

Overview of Municipal Solid Waste Management in Nigeria

Waste management is the act of collecting, storing, treatment, transportation and disposal of waste in a manner that is not harmful to biological life and the general environment (Ayantoyinbo & Adepoju, 2018). The right management of waste is aimed towards the avoidance of pollution that may result from inaction of not managing waste or its mismanagement in order to protect public health and avert ecological disasters. The management of MSW hitherto has remained a problem in most Nigerian cities as the sights of nucleated waste in public places are now serious causes for concern (Ojowuro et al., 2019).

Like most developing nations, the basis for solid waste management is geared towards public health protection and aesthetics maintenance. The focus is on waste collection and disposal at designated dumpsites (Sesan, 2018). In areas where waste carting systems are available, the wastes are usually comingled with little or no treatment before being transported and dumped at the dumpsites. Otherwise, the generators of waste look for easier ways and, in most times, no direct financial implication to them to get rid of the waste and they dump the waste in places such as, open spaces, road verges and medians, bushes, gorges, drainage channels, canals, waterways, bodies of water, among others (Adenaike & Omotosho, 2020). The negative consequences of these ways of disposing waste are enormous. The consequences associated with open dumping of solid waste are numerous and includes the pollution of the three major environmental media of water, air, and land (Ogundele et al., 2018). The decaying waste creates more avenues for maggots to grow, leading to more flies and other disease – carrying organisms. The decaying organic substances fill the atmosphere with stench and pungent smells. Leachate pollutes underground water; the aesthetic value of the environment

is destroyed by indiscriminate waste dumping within the metropolis (Yusuf et al., 2019). In most cities in Nigeria, institutions/systems for carting, transportation and disposal of waste exist, but differ from city to city in many facets.

The need to manage or protect the environment in Nigeria never seemed to be a salient issue before the 1988 saga of toxic waste dumping in Koko – a riverine town, near Warri in the former Bendel State (currently Delta State), South – South Nigeria (Akamabe & Kpae, 2017). The Koko hazardous waste dump saga centred around the discovery of about 1,800 drums of waste stored in the town without the inhabitants' knowledge of the inherent dangers. It was only after people from the community started dying unusually that the consignments from an Italian company were investigated and the cause of the strange illnesses and deaths were traced to the chemical waste in the drums (Ogbodo, 2009); a hazardous waste that has contaminated the community (Adeola, 2011). The happenings surrounding this, led to a serious outcry – locally and internationally, which resulted in the Italian company taking the responsibility of evacuating the waste from Koko out of the country after much diplomatic discussions. As a follow – up to the matter, a series of international workshops on the conservation of the environment were organized and held. One of the outcomes of these workshops was the coming up with a national policy on the environment that led to the creation of the Federal Environmental Protection Agency (FEPA) in 1988. Though, it was pointed out that the Environmental Protection Act did not give a clear definition of waste (Adeniran & Oyemade, 2016; Adewole, 2009). The agency was saddled with the responsibilities of environmental law administration and enforcement in Nigeria (Ogbodo, 2009) that included the aspect of waste management and the attendant pollution arising from waste (FEPA, 1988). From this scenario, several other agencies, ministries, strategies were developed and efforts were made towards environmental protection. However, all these efforts have not yielded much positive results as environmental management in Nigeria has been generally described to be marked with a 'litany

of woes' (Isife, 2012). By the Nigerian's 1999 constitution, the responsibility of municipal solid waste management lies on the third tier of the Government – Local Government Area (LGA) administration.

The Federal system operated in Nigeria is a three – tiered system of administration, comprising of the Federal (Federal Capital Territory, Abuja), the States (36 states) and the Local Government Areas (774 LGAs) that is closest to the citizens (Maiyaki et al., 2020; UNICEF, 2008). General sanitation services provisions which included municipal solid waste management is vested on the LGAs (Maiyaki et al., 2020) and accessibility to average sanitation services by the citizens vary widely within the country as it is estimated to range from as low as 15% in some area to 85% in others (Alepu et al., 2016; UNICEF, 2008).

By the law of the Federal Government of Nigeria (FGN), the local council authorities of the Local Government Areas (LGAs) are saddled with the responsibilities of managing municipal solid waste. However, sequel to the observed inefficiencies, some states were forced to intervene; leading to the creation of state environmental protection agencies or boards to manage solid waste among other environmental matters (Maiyaki et al., 2020). One of such states is Lagos State Government (LSG) that established Lagos Waste Management Authority (LAWMA) by virtue of Edict No. 55 of LSG of 1991 (Adeniran & Oyemade, 2016).

Lagos State Municipal Solid Waste Management Organization

It was asserted that prior to the oil boom era of the 1970s, rural – urban migration was very insignificant in Nigeria. But that, during the era of oil boom, there was massive migration of people from rural to urban areas that shut up the amount of waste generated in the urban areas in the early 70s that marked the beginning of solid waste management crisis in Lagos (Adeniran & Oyemade, 2016). One of the resultant effects of the urbanization and industrialization in the majority of the cities were the generation and accumulation of waste beyond what the existing capacities could evacuate. The irregular evacuation as at when due,

brought about waste being left – over and the continuous left – overs led to waste nucleation in different corners of the city (Onuminya & Nze, 2017). It was after FESTAC 77 – the Second World Black Festival of Arts and Culture, held in Lagos, Nigeria (Monroe, 1977; Said, 1977) that the growing solid waste problems in Lagos became a salient issue. Because of waste littering, the World Press after FESTAC 77 labelled Lagos as one of the dirtiest capital cities in the world (Emordi & Osiki, 2008; Hart, 1989; Salau, 1977).

The unenviable title of the dirtiest capital city in the world brought to fore the incapability of the Local Government Council's failure to meet up with the responsibility of managing solid waste, which has then become a phenomenon in the city of Lagos. After FESTAC 77 and the unfortunate level of filth in the city of Lagos, there was an institution of a waste management outfit known as Lagos State Refuse Disposal Board (LSRDB). The outfit was managed by a Canadian firm known as 'Powell Duffen Pollution Control Consultant'. As the responsibilities of the outfit were increased to cover more waste types outside mere domestic refuse, its name was changed to Lagos State Waste Disposal Board (LSWDB). Eventually, it metamorphosized into what is hitherto known as Lagos Waste Management Authority (LAWMA) in 1991 as empowered by Edit 55 that gave the agency the right to be wholly responsible for the management of waste in Lagos, against that obtainable with the Federal Constitution (MOE & WR, 2021).

Lagos Waste Management Authority (LAWMA)

LAWMA is the arm of Lagos State Government (LSG) that is responsible for the management of municipal solid waste in the State since its creation in 1991 (Olukanni & Nwafor, 2019). Lagos is seventh world fastest growing city and second fastest in Africa (Akujieze & Idehai, 2014). The increase in population comes with an increase in MSW generation which poses problems with the collection, transportation and disposal for some reasons. It is claimed that Lagos generates around 9,000 - 10,000 tonnes of municipal waste on

a daily basis (Ogunbiyi, 2018; Onuminya & Nze, 2017). The daily waste generation in Lagos still remains estimation as not all wastes are collected nor dumped legally. Olukanni and Oresanya (2018) claimed that around 12,000 metric tonnes of waste are generated in Lagos at an average of 0.72kg/person/day. Adenaike and Omotosho (2020) claimed that the daily generated amount of waste in 2014 was 13,000 tonnes by the 20 million inhabitants of Lagos. Also, by extrapolation and following the foregoing antecedents, it should have been 20,000 tonnes per day by 2020.

As the level of waste generated continued to increase, the waste generation rate over – powered the capacity of LAWMA to pick all the waste and this resulted in waste being observed in most nooks and crannies of the metropolis. It is worthy to mention that waste carting then was at no cost to the residence. In order to adequately manage the ever – increasing waste, Private Sector Participants (PSP) in waste collection, transportation and disposal were integrated into the waste management chain through a pilot phase in 1997, in Lagos. The collection of waste was outsourced to the private sector participants to massively cart waste from house to house while LAWMA picks the waste dumped indiscriminately at public places (Adeniran & Oyemade, 2016).

Private Sector Participants in Solid Waste Management in Lagos

The PSPs involvement in waste management is derived from the Public Private Partnership (PPP) policy that is often deployed in the resolution of important planning problems. It involves the sharing of risks and benefits by the private and public (government) sectors. PPP is usually put to use in enterprises that are controlled by government that is adjudged to be engulfed with unnecessary bureaucracies, soaked in corruption with resultant inefficiency in order to break barriers limiting the achievement of critical objectives for the common good of all the citizens. PPP has been successfully applied in other sectors of the Nigerian economy, such as housing, agriculture, transportation, and education, among others

(Aliu et al., 2014). The projects of the Lagos Public Private Partnership are bankrolled through public finance of the budget, stock exchange market bonds, local and international financial donors, private initiatives, and multilateral agencies, among others (Aliu et al., 2014).

In pursuit of satisfactory waste services delivery in the state, material and human resources are contributed by the government and the private sectors while the waste management processes are coordinated by LAWMA (MOE & WR, 2020; Aliu et al., 2014; LAWMA, 2013). By applying this PPP policy in waste collection in 1997, Lagos became the first Nigerian city to implement PPP models in the waste management value chain in Nigeria. In the PPP arrangement with the PSP Operators, they (PSPs) have access to government – financed schemes that allow the PSPs to access loans for the purchase of equipment that could enable them to function very well in the provision of waste services. The arrangement for the payment of the loans was well spread out to allow for gradual pay back while the PSPs business progresses (Sesan, 2018).

It was in that era that a waste service charge was introduced in the State where the PSPs were assigned and were operational. Since then, LAWMA has gone through different modification as waste managers, sole regulator or both; being supervised by different higher government authorities at different times. Olukanni and Nwafor (2019, p.6) presented in tabular form, the history of progression made since the involvement of PSP to the waste management chain (see Table 2.3).

Table 2.3*SWM History since the Infusion of PSPs in Waste Management Chain in Lagos State*

Year	SWM Institution	Advance in SWM	Supervising Authority
1997-1998	Lagos Waste Management Authority (LAWMA) and Private Sector Participation (PSP)	The private operators managed domestic waste while LAWMA managed industrial, commercial waste	Ministry of the Environment and Physical Planning (MEPP)
2004	Mega PSP in waste management	PSP operators were paid monthly by the state government while tenements were billed monthly to recoup the state fund	Ministry of the Environment/Office of the Deputy Governor
2007	Mega PSP in waste management	Procurement of additional collection trucks and compactors for more efficient service delivery	LAWMA/MoE
2009	Franchised Mega PSP in waste management, PPP arrangement with an American firm	Waste to compost facility sited at Ikorodu where organic waste is converted to fertilizer	LAWMA/MoE
2015	Build-operate-manage-transfer (BOMT) contract with West ENRG	Construction and operation of the first Material Recovery Facility (MRF) in Nigeria.	LAWM/MoE
2017	Cleaner Lagos Initiative with Visionscape Sanitation Solutions	Refurbishing building and upgrading SWM infrastructure including engineered landfills, transfer loading stations, MRFs etc.	MoE

Note. *Adapted from Public-private sector involvement in providing efficient solid waste management services in Nigeria*, Olukanni & Nwafor, 2019, p. 5 – 6.

The adoption of the PPP methods in the solid waste management chain in Lagos brought some level of sanity to waste collection in the state until the implementation of the Cleaner Lagos Initiative (CLI) in 2017 that slashed the involvement of the existing PSPs in waste management. This failed CLI caused the massive return of waste to the streets of Lagos (Sesan, 2018).

The downsizing of the PSPs in waste management by CLI also came with the intentions of a total privatization of other areas of waste management in Lagos. The initiative was implemented without a buy – in of the citizens or major stakeholders, nor were the possible consequences on the informal sector put into consideration. The initiative was imposed on the people through an executive order backed by the hurriedly passed ‘Lagos State Environmental Management and Protection Law 2017’ in a manner that is against the tenets of a democratic government. In it, the waste management sector was delegated to be overseen by the Ministry of the Environment (MOE) that played an advisory role, mediated on behalf of government with other stakeholders in waste management matters. Not only was there the downsizing of the number of PSPs in waste collection, transportation and disposal, LAWMA staff strength was disseminated. As at that time, One Hundred and Seven (107) experienced LAWMA staff were prematurely sent on compulsory retirement, Eight Hundred and Sixty – Two staff (862) were deployed to LGAs in a total transfer of service. LAWMA was left with only One Hundred and Three (103) out of the then over One Thousand (1000) staff strength (LAWMA File). LAWMA’s roles were reduced to being a licensing outfit that regulates waste collection, transportation, treatment and disposal (Adeniran & Oyemade, 2016). While the then constituted Public Utilities Monitoring and Assurance Unit (PUMAU) was to be concerned with waste services billing and enforcement. The implementation of the initiative was meant

to be majorly driven by private companies that did not pass through any publicly known competitive public tender. The company was given the right to decide on whether or not to use the existing PSPs. The whole clumsy arrangement, fate of the existing PSPs and the return of waste to the streets of Lagos led to a number of foul cries that made the government to back down from that initiative (Adenaike & Omotosho, 2020; Sesan, 2018).

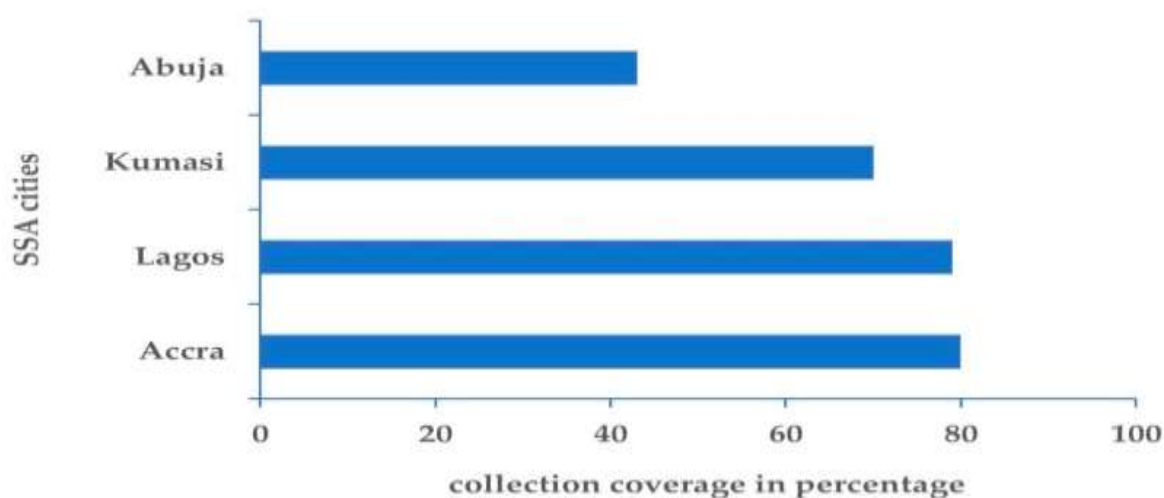
However, before LAWMA's complete balkanization, the CLI implementation failed in a serious policy somersault and LAWMA's status was gradually being re – instated. LAWMA now has over 400 staff (aggregated from the mainstream – officials deployed from MOE & WR, LGAs and those employed directly by LAWMA) to coordinate the collection and transportation of domestic, medical, commercial waste generated by over 22 million people living in Lagos. The mentioned staff strength (400) is exclusive of the 'Project Staff', 'Waste Handlers', 'Street Sweepers', amongst other ad hoc staff. LAWMA uses about 375 PSPs to achieve this enormous task. She also uses about 53 other PSPs to collect waste on the lagoon and waterways in the State. LAWMA also collects and destroys hazardous waste. It is estimated that on a daily basis, over 7,000 metric tonnes of wastes are collected, transported and deposited at the different designated dumpsites within the State (LAWMA, 2020). The PSPs collect the wastes as they are co – mingled by the generators. The collected waste is expected to only be dumped at the State's approved dumpsites.

Sequel to the observed environmental policy somersault of 2018, the least percentage of public waste collection was recorded since the involvement of the PSP in the waste collection, transportation and disposal of solid waste in Lagos State (Adedara et al., 2023; Kaza et al., 2018). According to Adedara et al. (2023), the lowest public waste collection rate as found in literature was 10% that was recorded in 2018 for Lagos. The change of Government as at 29th May, 2019 ushered in a new lease of hope for LAWMA and waste collection in Lagos Metropolis. In the same vein, Visionscape was compelled to handover all waste management

apparatus in her possession to LAWMA and hands – off waste management in Lagos amidst some levelled allegations. From then (2019) till date, there is a seeming progress in the collection of municipal solid waste collection in the metropolis of Lagos. However, the observed indiscriminate dumping of waste in public places seemed to be on the rise. Meanwhile the PSPs are responsible for door – to – door waste collection from residential, commercial and markets (traditional and plaza or ultra – modern) places. To aid the prompt removal of indiscriminately dumped waste in the public places, the State government bought One Hundred and Two (102) brand new compacting trucks with a LAWMA touch (LSG, 2021). A LAWMA touch in the sense that LAWMA’s Engineering section contributed to stating certain specifications for the compactors that were built in China and assembled in Lagos, Nigeria. At present, to improve the effectiveness of door – to – door waste collection, the collection areas were re – delineated. In place of political voting wards as franchised areas, slots were created where 2 compactors are to cover 50 streets on the average. Currently, 427 PSPs are registered and are active in the evacuation of household and commercial waste. The 427 PSPs have (as at June 2023) 815 active compacting trucks used for the solid waste collections in Lagos State. Adedara et al. (2023) claimed that progress is being made in the collection of the generated municipal solid waste in Lagos. In their presentation (Figure 2.8) of the percentage of waste collection coverage of some selected cities in the sub – Saharan Africa (SSA), it was indicated that Lagos has achieved circa 80% collection in 2023 compared to 10% collection recorded after the environmental management policy somersault of 2018.

Figure 2.8

Percentage of Waste Collection Coverage in some Sub – Saharan African Cities



Note. Adapted from *Municipal solid waste collection and coverage rates in sub-Saharan African countries: A comprehensive systematic review and meta-analysis*, Adedara et al., 2023.

Waste Generation Trend in Lagos

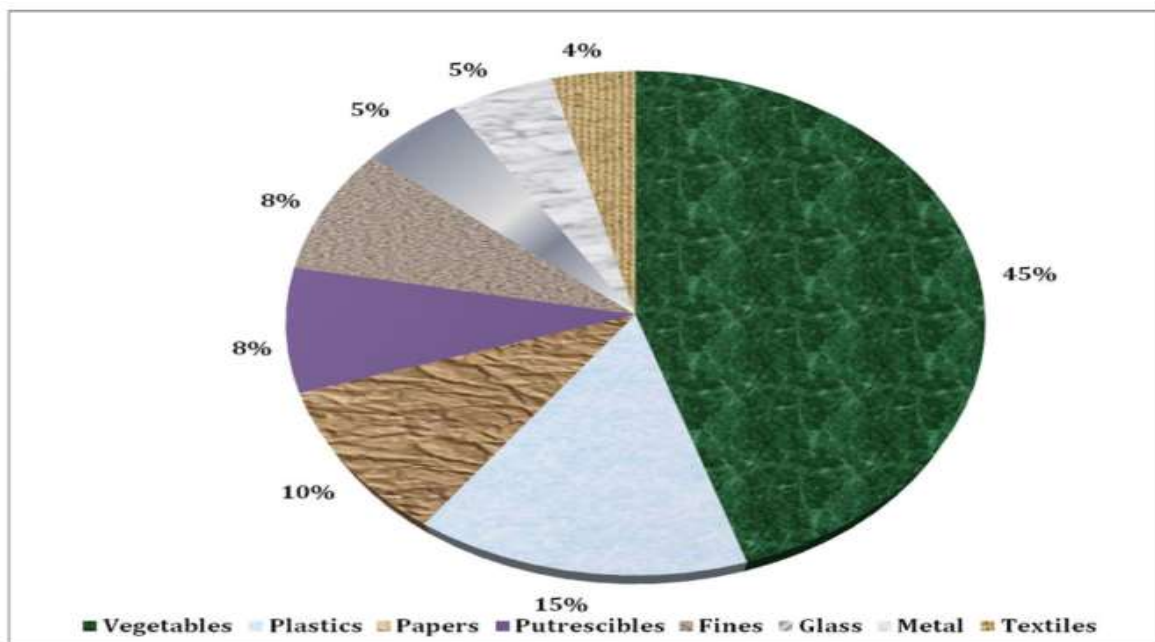
Lagos is the largest black populous city in the world and the most populated city in Africa (Adenaike & Omotosho, 2020). It has one of the highest population growth rates in Africa (Statista, 2023). If Lagos was a country on her own, she would have been ranked fifth strongest economy on the African continent (Osho & Adishi, 2019). About 65% of the Nigeria's industrial capacity is situated in Lagos and the State generates about 90% of trade flow in Nigeria. Though Lagos is the commercial hub of the nation, unfortunately, estimated 60% of the inhabitants live in abject poverty with constrained access to basic infrastructure, such as road, healthcare, and sanitation services. The state has the biggest seaport in Africa and the busiest international airport in the region, making her the major business route in the region (Osho & Adishi, 2019). The state increases in population with over 600,000 people added to her annually. With a growth rate of 3.4%, it was stated that Lagos increased with over 525.9% from 1963 to 2006. Also, that from 2006, it increased by 754% in 2015 (Ayeni, 2017). The

aforementioned features/metrics of Lagos have a way of affecting the rapid waste generation trends and content of waste stream (Ayantoyinbo & Adepoju, 2018).

Oresanya and Olukanni (2018) prepared a pie chart of waste stream of Lagos state (see Figure 2.9) which indicated that around 45% of the waste stream by weight is organic waste which can decay easily while the second largest is plastic waste of different types that does not decompose with ease.

Figure 2.9

Composition of Typical Solid Waste generated in Lagos, Nigeria



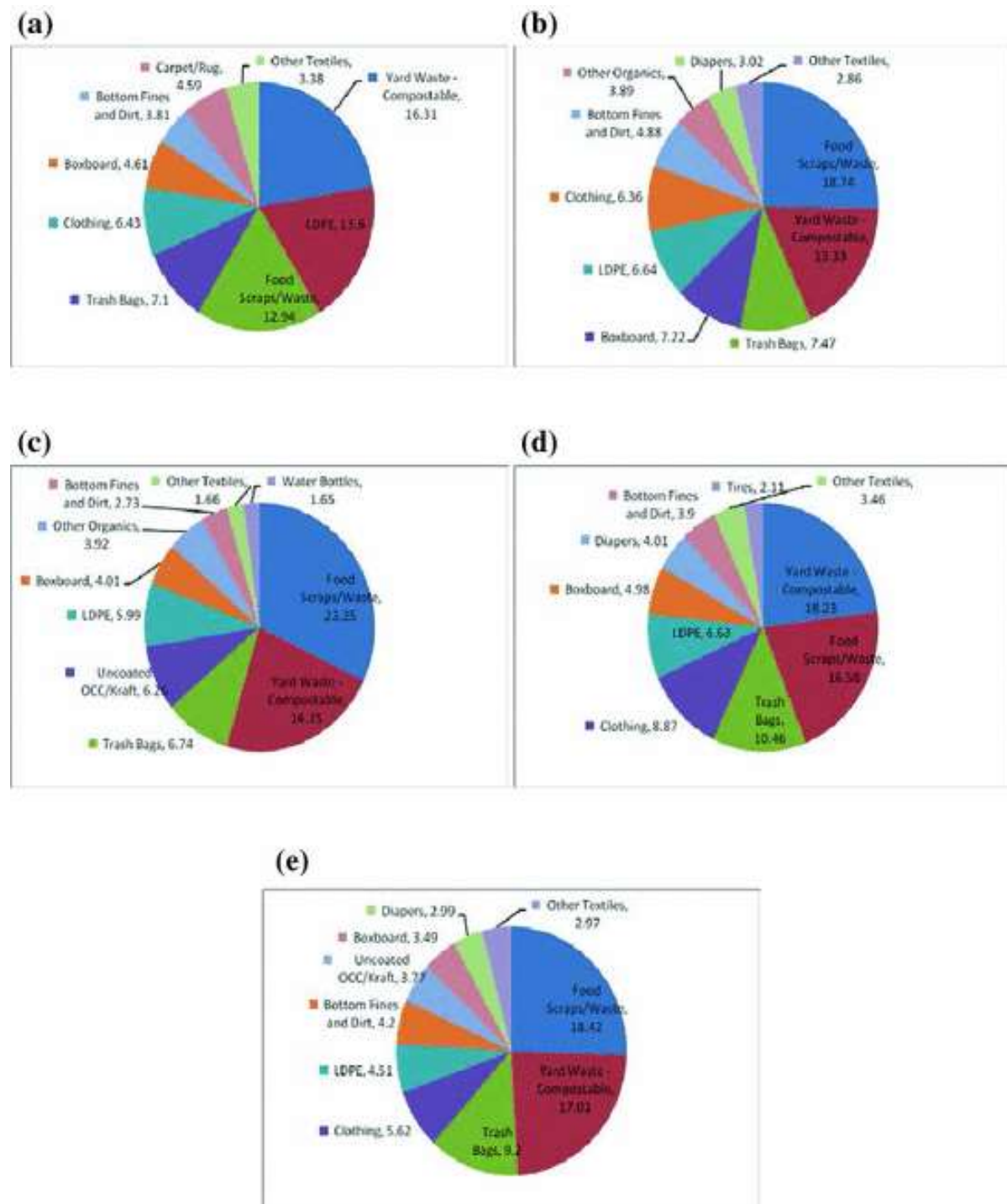
Note. Adapted from *Progressive waste management operations in Lagos State, Nigeria: A mini-review*, Oresanya & Olukanni, 2018.

Ojowuro et al. (2019) carried out the characterization on solid waste from different residential quarters on land use, income level, and population density basis in Lagos metropolis. The study was carried out by the initial delineation of the metropolis into (a) ‘high – density – low – income area’ (HDLI); (b) ‘high – density medium – income area’ (HDMI); (c) ‘medium – density high – income area’ (MDHI); (d) ‘medium – density – low – income area’ (MDLI) and (e) ‘low – density – high – income area’ (LDHI). Solid waste carted from

commercial areas was also audited. Their findings revealed that irrespective of the variances of the study area as stratified, there was only slight compositional disparity with the residential wastes: organic waste content ranged from 33.06% to 46.25%; plastic waste content varied between 12.73% to 20.70% while paper and textiles were between 4.61%-10.30% and 1.66%-12.33% respectively (see Figure 2.10). Solid waste carted from commercial premises differed in terms of composition as the highest content was plastic, which was followed by organics that was 22.00% while paper and textiles were each 14.00% (Figure 2.11).

Figure 2.10

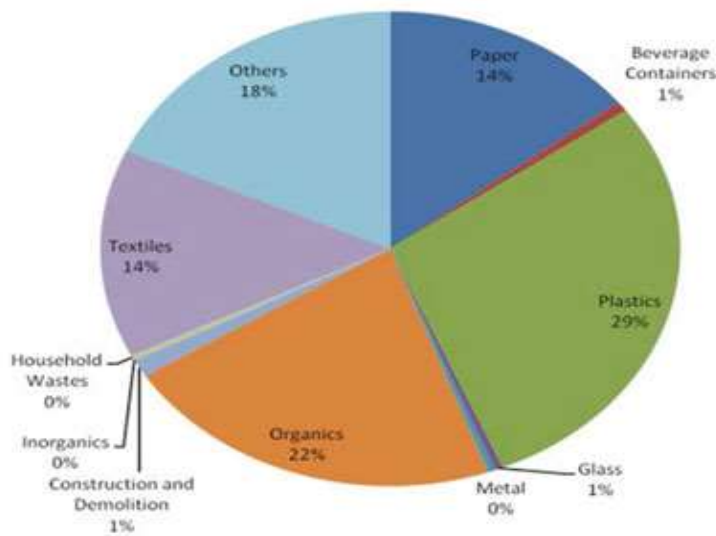
Solid Waste Compositions from different Economic Strata and Population Density in Lagos Metropolis



Note. Adapted from *Characterization of municipal solid wastes from Lagos metropolis, Nigeria*, Ojowuro et al., 2019.

Figure 2.11

Composition of Solid Waste Carted from Commercial Areas of Lagos Metropolis



Note. Adapted from *Characterization of municipal solid wastes from Lagos metropolis, Nigeria*, Ojowuro et al., 2019.

Waste Collection Arrangement

By the existing arrangement, LAWMA collects all solid waste types from areas considered to be public places or government owned areas, such as transportation routes – highways, expressways, major roads and streets, public schools, traditional markets, government owned institutions, parks and gardens. Other areas that are not classified as public places are the responsibility of the PSPs to cart waste, such places like households, plazas, shopping complexes, industries, hotels and other commercial enterprises (Oresanya & Olukanni, 2018). Despite this arrangement, the management or collection of solid waste is still faced with a lot of challenges of different sorts.

Waste Disposal Challenges in Lagos

The concept of urban metabolism of resource can be likened to the natural metabolism of nutrients in living organisms in a healthy ecosystem. Humans for instance need to remove waste from the system; so also, it is necessary that the generated waste in the cities are removed as at when due and where this is not so, problems will arise. The inability to remove these

wastes as at when due will be for some reasons beyond the power of those on whose purview lies the responsibility to do so (Ayantoyinbo & Adepoju, 2018). In order to effectively curb the nuisance associated with extant solid waste management practices, it is pertinent that the challenges encountered in managing the wastes in the particular area are deciphered, so as to know the appropriate approaches to apply (Olukanni et al., 2016).

The main focus of waste management in the city of Lagos is more of collection, transportation and disposal without emphasis on waste treatment or sorting (Salami et al., 2018). The challenges around this stage of waste management are varied and can be context specific or peculiar to the area in question. Some of the challenges as enumerated in some literature and information sources included the following:

The uncontrolled urbanization that is bringing about continual peri – urban sprawling with slums that lack basic sanitation amenities and infrastructure. The migration to Lagos from other parts of Nigeria and neighbouring countries has contributed to the continual rise in waste generation without commensurate increase in finances for waste management (Ayantoyinbo & Adepoju, 2018). The urbanization and industrialization do not only increase volume of generated waste, they come along with an increase in complexity of municipal wastes which brings about more difficulty in their management (Amuda et al., 2014).

Perception of the citizens concerning sanitation goes a long way to determine the success or failure of the solid waste management programmes. Perceptions are also related to orientation of individuals or a group of people towards sanitation, in this case (Daramola, 2016). The Lagos society believes that solid waste management is supposed to be done for free by the government and as such, the citizens must not be asked to pay for waste carting charges (Olukanni et al., 2016). Consequently, some residents with this notion in mind might not want to give their waste to appointed PSPs to avoid the service of bills on them. For that reason, they look for open spaces to dump the waste. Some of the areas where the wastes are dumped might

be accessible to government manned trucks to cart, but others may not be reachable by such vehicles. Hence, the waste remains unattended to with its attendant negative impacts (Ayantoyinbo & Adepoju, 2018; Olukanni et al., 2016).

Inadequate funding in the waste management sector for the acquisition of facilities and daily running of all facets of waste management has remained a challenge to the management of solid waste in Lagos, like most cities of the developing countries (Ayantoyinbo & Adepoju, 2018). Inadequate budgetary allocation for the management of waste, as the sector it is viewed to have low returns on investment at initial stages (Olukanni & Oresanya, 2018). Most people are not willing to invest in the waste management value chain as waste management involvement has been tied to a business of the down – trodden; though, there is better understanding in this matter now than the previous decades back. However, a wrong attitude persists with individual first handlers of waste like the householders or members of the household (Ajiboye, 2017).

The administration of solid waste management by the application of command – and – control mechanism. A situation where the major stakeholders are not carried along in the planning phases but are meant to be forcefully involved in implementation stages (Oyebode, 2018).

Lack of enough dumpsites for the collected refuse in the city of Lagos is a great challenge; the majority of existing dumpsites are already covered by the development of residential and industrial structures. The dumped wastes are already mountainous, making dumping points difficult to be reached by some already weak compacting trucks (Agbesola, 2013).

Vehicular traffic situation in Lagos is better imagined than experienced whenever it occurs, which can and does distort waste carting arrangements by the PSPs. Delay in the evacuation of the waste as at when due will lead to overfilled containers and overflow of waste to the neighbouring environment. Traffic thus tampers with the turn – around – time of waste

collection and hampers adequate waste collection to further aggravate an already bad situation (Olukanni et al., 2016).

The lack of data on the amount of generated waste and other planning metrics is a challenge to waste management in the State (Olukanni et al., 2016). The academic research on waste management for the sake of sustainable waste management policy formulation is low (Ajiboye, 2017).

Lack of sustainable standard policy in the entire facets of solid waste management chain. Waste in Lagos is co – mingled without emphasis on waste prevention and sorting at source (Dias, 2016; Omole et al., 2016).

Government agencies on whose purview lays the responsibility of waste management lack institutional capacity (Amuda et al., 2014).

Lack of public awareness on implications of indiscriminate disposal and the public not given the opportunities to buy – in to the programme earmarked for sustainable solid waste management (Olukanni et al., 2016).

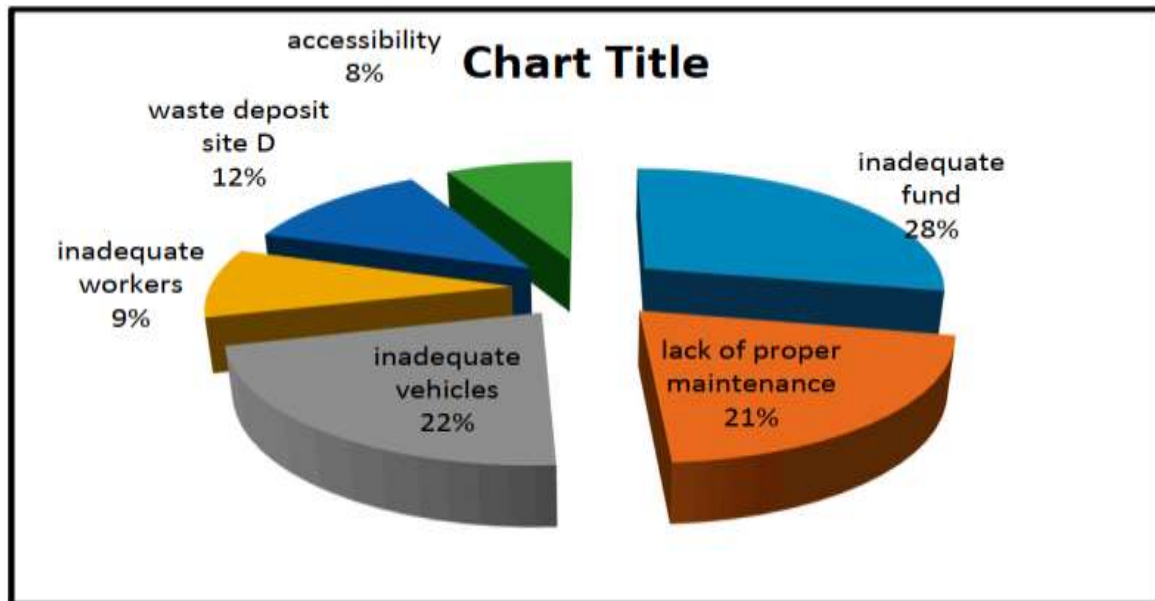
Lack of enforcement of existing environmental laws (Oyebode, 2018).

Lack of adequate maintenance of infrastructure of waste management in the state as at when due and the lack of adequate logistics reaching the waste management staffers (e.g., LAWMA) to carry out their responsibilities effectively (cf. Amusan, 2018).

Ayantoyinbo and Adepoju (2018, p.9), showed logistic problems that have posed challenges to LAWMA and have contributed to hindering the performance in solid waste management in the state of Lagos (see Figure 2.12). They found out that the existence of inadequate funding is the major constraint; followed closely by inadequate vehicles and a poor maintenance culture.

Figure 2.12

LAWMA's Logistic Challenges Hampering Effective Solid Waste Management in the State



Note. Adapted from *Analysis of solid waste management logistics and its attendant challenges in Lagos metropolis*, Ayantoyinbo & Adepoju, 2018.

Plastic Waste Management in Lagos, Nigeria

It is no longer news that the challenges posed by plastic waste pollution is an extant global concern (Debrah et al., 2021; Egun & Evbayiro, 2020), although they vary from region to region (Verma et al., 2016). The pollution cuts across the three basic environmental media of land, water and air (Kehinde et al., 2020). As a matter of fact, it has adverse implications on air (Chow et al., 2017) and water bodies like the marine pollution: that means that it is not localized (Jambeck et al., 2015); has no boundary, has adverse effects in areas outside its place of origin for the present and future generations (WHO, 2018).

Unfortunately, despite the understanding of the inherent challenges associated with the use and mismanagement of plastic waste, its use has continuously been on the increase from its first introduction over six decades ago (Olanrewaju & Oyebade, 2019). For instance, as at 2016, world production of plastic products was 348 metric tonnes; the amount increased to 359 metric tonnes by 2018. With the entire African production staked at 7.1%, Europe produced

about 18.5%, while China produced 29.4% of the total amount. It was also stated that the global production of plastic waste resulting from the ever – increasing use rose to about 6.3 billion metric tonnes from 1950 to 2018; of this amount, 12% were incinerated while approximately 9% were recycled and the remaining 79% were untreated and possibly accumulated in legal dumpsites/landfills or on the natural environment (cf. Debrah et al., 2021; OECD, 2018). Nigeria is not only involved in the increasing use of plastic products, but also contributing to the mismanagement of plastic wastes with the attendant adverse consequences experienced on a daily basis (Dumbili & Henderson, 2020; Babayemi et al., 2019). These plastics come in different forms and shapes, as well as in different products into the nation.

Major Sources of Polymers/Plastics Importation to Nigeria

The majority of raw materials for the plastic production in Nigeria come from the importation of resins from which different types of plastics are produced while the remaining comes in other products as fractions. Alabi et al. (2019) put up in tabular form, the different types of common plastics with their uses, properties and what they can be recycled into (Table 2.4).

Using the UN's plastic Harmonized System (HS) codes, between 1996 and 2014, the primary polymers with HS codes 3901 – 3914 accounted for approximately 15.8 metric tonnes and plastic in products with code HS 3915 – 3926 accounted for circa 4 metric tonnes. A combination of these plastics as products and the primary polymers accounts for 75% of the entire volume of plastics that are imported into the country according to the available information. With emphasis, it is stated that a high percentage of the primary polymers imported are used in the production of packaging materials (Ncube et al., 2021) and items usually associated/found in households: items such as footwears, headgears, chairs/tables, cutleries, amongst other kitchen utensils. Such packaging materials are made or designed to be immediately discarded at point of use (Ncube et al., 2021; Jambeck et al., 2015). The other

largest plastic types in second and third positions imported into Nigeria are in products such as vehicles of all types and electronics which stand at 2.9 metric tonnes and 2.6 metric tonnes respectively. It is worthy to mention that these types of plastics are not imported into the country under the HS code of plastic.

Table 2.4

Major Plastic Types and their Common Use, Properties, and Recyclable Options

Symbols	Types of plastics	Common uses	Properties	Recycled into
	Polyethylene terephthalates	Soft drinks, water bottles, containers, salad dressing, biscuit trays and salad domes.	Clear, tough, solvent resistant, barrier to gas and moisture, softens at 80 °C.	Pillow and sleeping bag filling, clothing, soft drink bottles, carpeting, building insulation
	High density polyethylene (HDPE)	Shopping bags, freezer bags, buckets, shampoo, milk bottles, ice cream containers, juice bottles, chemical and detergent bottles, rigid agricultural pipe, crates	Hard to semi-flexible, resistant to chemicals and moisture, waxy surface, opaque, softens at 75 °C, easily coloured, processed and formed	Recycling bins, compost bins.
	Polyvinyl Chloride (PVC)	Cosmetic container, plumbing pipes and fittings, electrical conduct, blister packs, wall cladding, roof sheeting, bottles, garden hose, Shoe soles, cable sheathing, blood bags and tubing.	Strong, tough, softens at 80 °C, can be clear, can be solvent welded.	Compost bin
	Plasticized Polyvinyl chloride PVC-P.		Flexible, clear, elastic, can be solvent welded.	
	Low density polyethylene (LDPE)	Refuse bags, Irrigation tubings, mulch film, cling wrap, garbage bags, squeeze bottles	Soft flexible, waxy surface, translucent, softens at 70 °C, scratches easily	Bin liners, pallet sheets
	Polypropylene (PP)	Microwave dishes, lunch boxes, packaging tape, garden furniture, kettles, bottles and ice cream tubs, potato chip bags, straws	Hard and translucent, soften at 140 °C, translucent, withstands solvents, versatile.	Pegs, bins, pipes, pallet sheets.
	Polystyrene (PS)	CD cases, plastic cutlery, imitation glassware, low-cost brittle toys, video cases/foamed polystyrene cups, protective packaging, building and food insulation	Clear, glassy rigid, opaque, semi-tough, soften at 95 °C, affected by fat, acids and solvents, but resistant to alkalis, salt solutions, Low water absorption, when not pigmented is clear, is odour and taste free.	Recycle bin

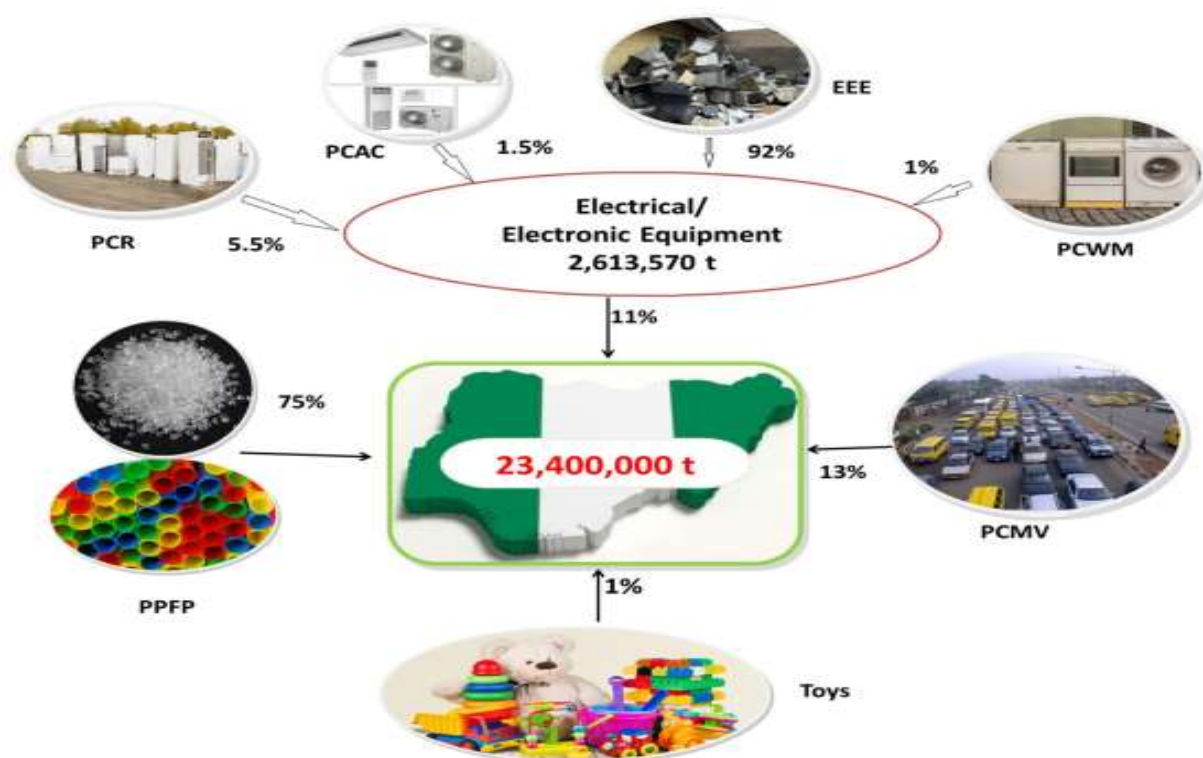
	Expanded polystyrene (PS-E)		Special types of Polystyrene (PS) are available for special applications.	
	Other	Automotive and appliance components, computers, electronics, cooler bottles, packaging	Includes all resins and multi-materials (e.g. laminates) properties dependent on plastic or combination of plastics	Recycle bins

Note. Adapted from *Public and environmental health effects of plastic wastes disposal: A review*, Alabi et al., 2019, p. 2 – 3.

Pictorial representation summarizing the foregoing among other vital information is as shown in Figure 2.13 (Babayemi et al., 2019). This study is more inclined to the plastics with HS codes and originating from the households (Babayemi et al., 2018).

Figure 2.13

Main Plastic Types and Polymers Imported into Nigeria between 1996 – 2014



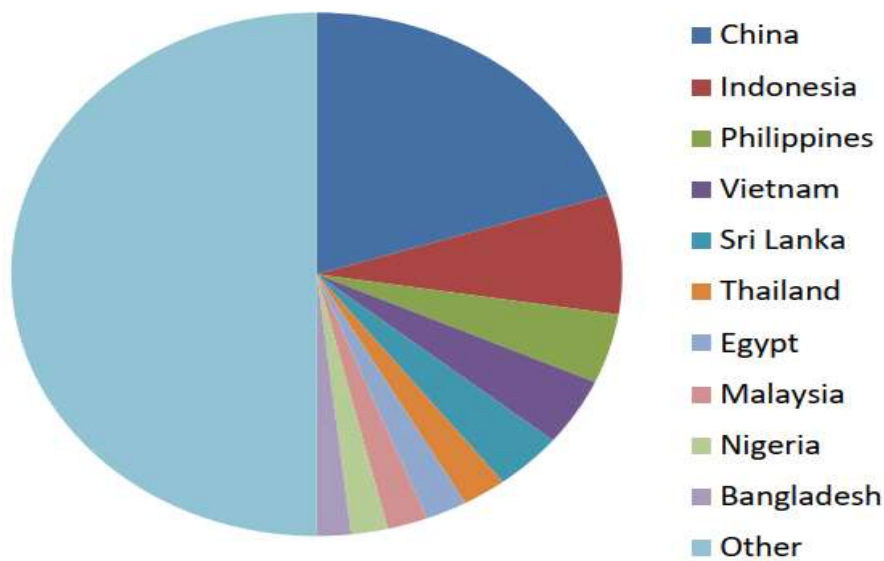
Key: Imported polymers (in primary form and as plastic products) (PPFP); Plastic components of refrigerators (PCR); Plastic components of air conditioning equipment (PCAC); Plastic components of laundry washing machines (PCWM); Plastic components of motor vehicles (PCMV); Categories 3 and 4 of European Union electrical and electronic equipment (EEE) classification; Toys (T)

Note. Adapted from *Initial inventory of plastics imports in Nigeria as a basis for more sustainable management policies*, Babayemi et al., 2019.

It is claimed that between 1996 and 2014, Nigeria imported about 14,200,000 tonnes of plastic products (Babayemi et al., 2018). The majority of plastics that are produced in Nigeria were made from raw materials that were imported into the nation (about 70%); the other fractions of about 30% are manufactured from recovered/recycled plastic waste (Olanrewaju & Oyebade, 2019). It is asserted that Nigeria is ranked ninth in the world; first in Africa, in the mismanagement of plastic waste (Jambeck et al., 2015; OECD, 2018) and a pie chart in this regard is as depicted in Figure 2.14 (OECD, 2018).

Figure 2.14

Pie Chart on the Mismanagement of Plastic Waste in 2010, in Descending Order by Countries

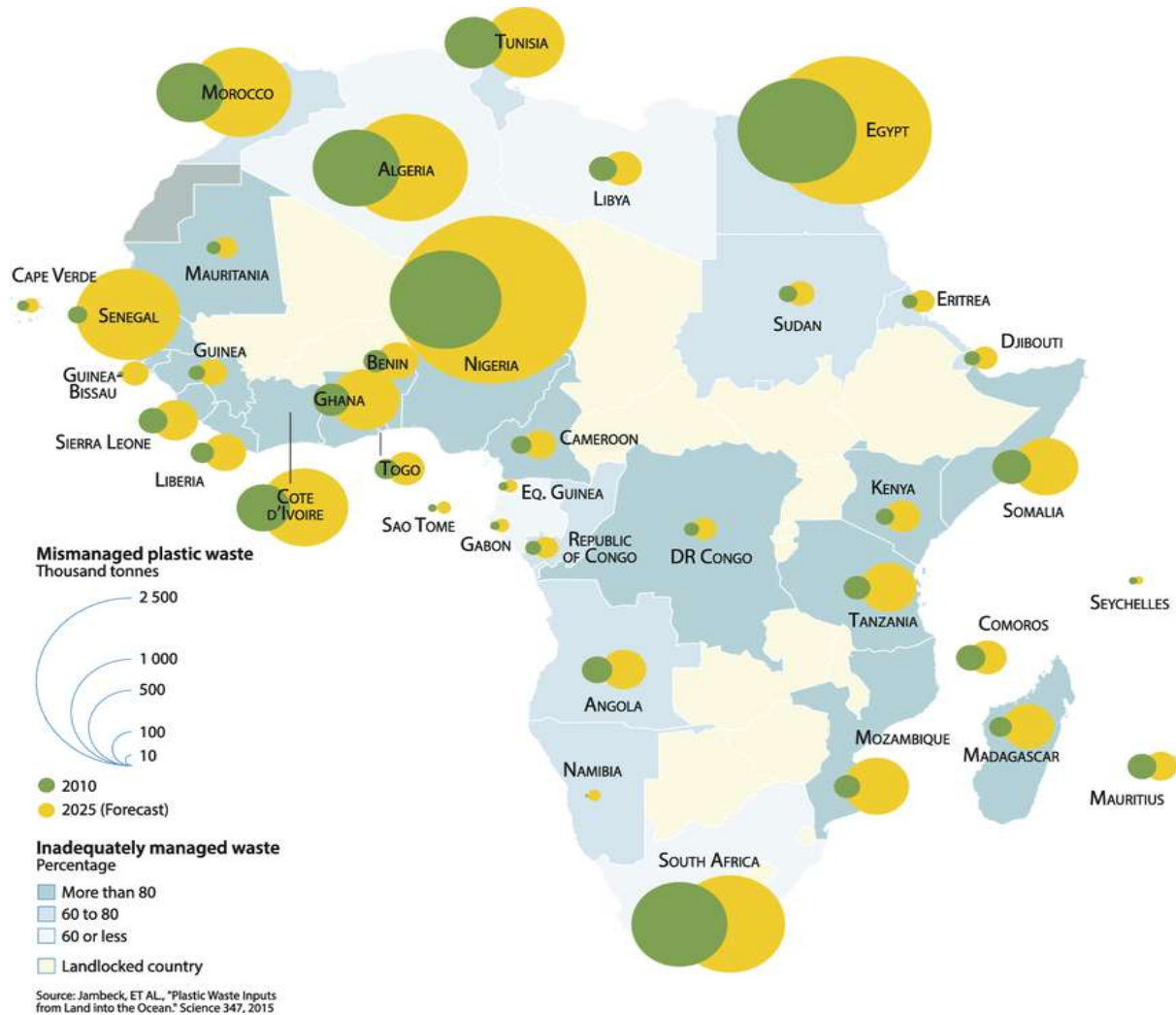


Note. Adapted from *Improving plastics management: trends, policy responses, and the role of international co-operation and trade*, OECD, 2018.

Olanrewaju and Oyebade (2019), acclaimed that plastic packaging industries in Nigeria were circa 50 in the 60s but that by 2013, they have increased beyond 3,000 and their production capacity is estimated to be well over 100,000 tonnes in a year. Due to industrial development and globalization that has altered Nigeria's consumption pattern amongst others, there is an increase in the per capita plastic consumption. A situation that has risen from 4.0kg/capita to 6.5kg/capita within a period of ten years (from 2007 to 2017) and by 2020, it was estimated to have hit 7.5kg/capita. It is acclaimed that Nigeria ranked first in the mismanagement of plastic waste in Africa (OECD, 2018), and is second in the use of plastic products in the African continent (see Figure 1.0) and that with business – as – usual, the projected value in a few years to come might be ecologically, socially and economically unbearable. Figure 2.15 shows the mismanagement of plastic waste by African countries as at 2010 and the projected level for 2023 in a business – as – usual scenario (Jambeck et al., 2017). Therefore, they opined that now is the time to act (Babayemi et al., 2019; Jambeck et al., 2017).

Figure 2.15

Map of Africa showing Countries Ranking in Plastic Waste Mismanagement



Note. Adapted from *Challenges and emerging solutions to the land-based plastic waste issue in Africa*, Jambeck et al., 2018.

Of recent, plastic waste matter has been one of the most discussed international issues on the agenda in solid waste management worldwide (Alabi et al., 2019; Godfrey, 2019; Narancic et al., 2018). One of the emphasized recommendations from the Conferences of the Parties to the Basal and the Stockholm Conventions as a way of minimizing the adverse effects of plastic waste is to see regional and coordinating centres work together and put in place measures to prevent further plastic pollution through sound environmental management (Babayemi et al., 2019).

These first six countries were reported to be responsible for around 74.6% of the total plastic consumption by the 33 countries in Africa. Sources showed that an average of 13% of Nigeria's MSW is plastics; with average of 0.58kg per capita per day of MSW generation, it will amount to around 212kg/capita/year and that about 0.85 metric tonnes of plastic wastes are yearly mismanaged. Considering that Lagos has the highest urbanization rate as well as being the top municipality in Nigeria; with as high as 0.95 kg/capita/day, it will amount to about 347kg/capita/year of plastic waste generation. At about 12% plastic recycling rate, then, approximately 88% will end up on the natural environment, either deposited or burnt with subsequent adverse effects (Babayemi et al., 2019).

Adverse Effects of Plastic Production and its Waste Mismanagement

The adverse impact of the present plastic waste management in Lagos, Nigeria cut across many facets of life, socially, economically and environmentally. For instance, the processes involved in the manufacturing of plastic and the unsustainable management of plastic waste is implicated in the generation of some level of greenhouse gases that is fingered as one of the contributors to the climate change being experienced worldwide (Bauer et al., 2022; WEF, 2022). It was estimated that in 2015, the amount of global greenhouse gas emission arising from the life cycle of plastic stood at 1.8 gigatons of carbon dioxide equivalent (Gt eq.CO₂) and that the amount is expected to be seriously on the rise from between 3 – 5 times in a business – as – usual scenario (Bauer et al., 2022).

The plastic production processes are acclaimed to consume around 4 – 8% of the world's oil and gas production as a result of the use of fossil fuel as feedstock and with business as usual, this amount is projected to increase heavily in the future (OECD, 2018). Ncube et al. (2021) asserted that as at 2009, the percentage of global oil production used in the production of plastics was 8% but that, as at 2019, it has increased by 10%; implying a 10% increase within a space of ten years. The use of virgin raw material for plastic production requires the use of

earth's finite natural resources. With the present plastic waste management practices, it leads to the loss of resources and economic development.

The qualities of plastic that made it attractive for use is also part of its undoing (Verma et al., 2016) that is making the world to think in the direction of its sustainable management or outright ban on its use in some quarters. Continuous use and application in different areas had led to the generation of more of its waste types. Coupled with its wastes' poor end – of – life management; it has led to the accumulation, worldwide spread and persistency associated with the pollution. Of the estimated 6,300 metric tonnes of plastic waste generated globally from 1950 to 2015, only 9% were acclaimed to have been recycled, 12% of the total amount were incinerated while the remaining 80% were either land filled or left on the natural environment. Being usually light products, they are easily blown by wind or carried away by storm water into bodies of water and eventually to the oceans, even to remote areas such as, deep seas, islands, the poles, among others (OECD, 2018).

The presence of plastic in the metropolis of Lagos is disturbing to behold. They distort the aesthetics of the physical environment as they become like scattered patches on parks and gardens, green areas and landscaped road verges (Dumbili & Henderson, 2020; Wagner – Lawlor, 2018). Mismanaged plastic waste destroys natural land surfaces and disorients the biodiversity as they block soil air holes and prevent water penetration, leading to the change in original fauna and flora development within the affected ecosystem. Mismanaged plastic waste contributes to rendering farmlands unproductive and fuel wildfires (Dumbili & Henderson, 2020).

Marine pollution resulting from mismanaged plastic is of global concern as it has been ascertained that some millions of tonnes of plastic wastes make their way into the ocean yearly (Alabi et al., 2019). Plastic fragments with time, though very slowly and these fragmentations even make it more difficult to remove from the water environment (Alabi et al., 2019). It is

established that these tiny fragments of plastics are sometimes mistaken for food and are ingested by organisms and this could gradually lead to their death and eventual biodiversity and economical loss. It is also documented that plastic waste in the body of water can and does entangle and kill sea organisms (Jambeck et al., 2015). Of the total amount of plastic waste estimated to be in the marine environment, Nigeria is said to contribute between 0.13 to 0.34 metric tonnes of it and with this amount, she is ranked ninth in the world among the highest contributors in the plastic pollution of waterways and the seas. Out of this amount, Lagos (study area), a coastal megacity contributes around 450,000 tonnes of plastic waste per year to the ocean (Dumbili & Henderson, 2020).

The majority of storm water drainages in Lagos and the entirety of Nigeria are open water channels and canals. The used plastics that are not properly managed find their way into the drainages and water channels, constituting hell of nuisance. For instance, they obstruct free flow of water by blocking the waterways and since water will find its course, storm water is diverted. The storm water diverted at blocked spots flows onto the road surfaces to eventually lead to road/street destruction, flash flooding, contributing to vehicular traffic go slow, etc. The clogging of drainages, bring about deposit of debris at the spots after the flash flood, leaving substrate for plants to grow on the drainages. Some percolated water becomes a breeding ground for mosquitoes that are vector organisms for malaria parasites (Dumbili & Henderson, 2020).

Table 2.5

Some Chemicals that are given-off as a Result of the Burning of Polyvinylchloride and their Health Effects

Compound	Health Effect
Acetaldehyde	It causes lesions and damages the nervous system
Acetone	Irritation to eyes and respiratory tracts
Benzaldehyde	Eyes, skin, respiratory system irritations, causes limitation in brain function
Benzole	Carcinogenic, negative impact on bone marrow, liver, and immune system
Formaldehyde	Serious eye damage, carcinogenic, may cause pulmonary oedema
Phosgene	Corrosive to the eyes, skin and respiratory organs
Polychlorinated dibenzo-dioxin	Carcinogenic, irritates the skin, eyes and respiratory system. It damages the circulatory, digestive and nervous system, liver, bone marrow
Polychlorinated dibenzofuran	Irritates the eyes and the respiratory system, causes asthma.
Hydrochloric acid	Irritates the eyes, the skin and the respiratory tract. It can also affect the central nervous system
Toluene	Irritates the eyes and the respiratory tract, can cause depression
Xylene	Irritates the eyes. It can also affect the central nervous system, reduces the level of consciousness and impairs learning ability
Propylene	Damages the central nervous system by lowering of consciousness
Vinyl chloride	Carcinogenic, irritating to eyes, skin and respiratory system. Effect on the central nervous system, liver, spleen, blood-forming organs

Note. Adapted from *Public and environmental health effects of plastic wastes disposal: A review*, Alabi et al., 2019, p. 5.

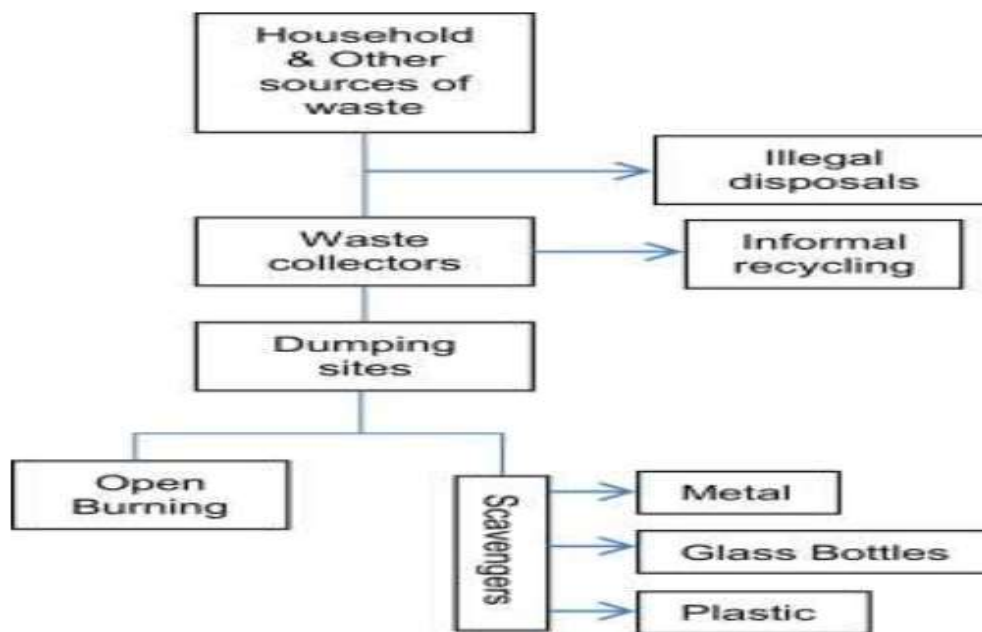
Open burning of plastic waste as a means of waste management potent lots of danger for human health and the environment since some contain very toxic constituents (Verma et al., 2016). The burning of refuse is often overlooked in larger parts of Nigeria (Daffi et al., 2020) and even where it is prohibited like in Lagos, the burning is still practiced illegally in some areas (Ogunmakinde et al., 2019). However, it is established that the burning generates other chemical substances that are unhealthy to humans and the environment. Table 2.5 shows some chemical compounds that are given – off as a result of burning a variant of plastic classed as ‘polyvinylchloride’ (Alabi et al., 2019).

Transition efforts towards Sustainable Plastic Waste Management by the Formal Sector in Lagos

Plastic waste is the second largest waste fraction in the municipal solid waste stream of Lagos State, Nigeria and they have high recyclability potentials (Babayemi et al., 2018). The current mismanagement of plastic waste is a major burden for most cities in developing nations as the consequences are far more noticed now than ever. The unsustainable plastic waste management and its burden can be overcome by plastic waste recycling which will entail plastic waste recovery and their reprocessing into its original form or other useful forms (Olanrewaju & Oyebade, 2019). The general extant waste management system obtainable in Nigeria focuses mainly on waste collection, transportation to open dumping areas, usually away from the urban centres to outskirts of the cities. Figure 2.16 is a schematic representation of the solid waste management scenario in Lagos, Nigeria. It seems more of ‘out of sight, out of mind’ principles as there are lacuna concerning recycling and resource recovery processes (Obidike et al., 2020).

Figure 2.16

Schematic Diagram of Extant Framework of MSW Management Practice in Nigeria



Note. Adapted from *A critical analysis of the role of energy generation from municipal solid waste*, Obidike et al., 2020.

MSW are comingled in Lagos, Nigeria and dumped at the approved dumpsites where the majority of the recyclables are recovered by scavengers; examples of recyclables retrieved at the dumpsites by scavengers are plastics, metals, glasses, papers, and electrical waste. Among these recyclables, efforts have been made to support plastic recycling by Lagos State Government more than the others and yet, plastic waste remains a burden to manage in Lagos. Some of the efforts are as enumerated based on the available information.

Adenaike and Omotosho (2020) stated that one of the first attempts made by Lagos State towards resource recovery was in 1981 with the plans of building 5 incinerating plants. However, the comingled waste would first be dumped at the sorting centre in the neighbourhood of the plant to remove/recover recyclable materials like plastic, tins, glass, amongst others by those who needed them before the remaining are incinerated. Unfortunately, the few constructed incinerators never fulfilled the purpose for which they were constructed.

One of the single use plastic packages is the pure water sachet that was said to been invented by Mrs. Victoria Oginni in 1990. At a time, the sachet water became a major portable water source for those on the go as well as at partying occasions and for household usages. This sealed plastic sachet was perceived to be more hygienically packed as compared to the ones packed and tied by hand for different consumables. The management of waste arising from these plastic packages became a serious concern as there were almost everywhere. The damages were so pronounced that banning its production and sales was then contemplated (Dumbili & Henderson, 2020). But after several meetings and strategizing at various governmental levels with the plastic producers and pure water companies, the banning option was dropped.

In 2006, the strategy of ‘nylon – buyback – scheme’ was initiated and implemented in the state. It entailed the collection of the nylon by individuals from public places. The individuals do not necessarily have to register with any agency since it was open for whoever wanted to engage in it. The recovered plastic/nylons are delivered to government – approved off – takers either treated or untreated. These approved off – takers were also financially empowered by the government to instantly pay the deliverers according to agreed rates per kilogram of plastic (the cleaned or treated nylons are rated more). To receive the recovered nylons, government established 12 official collection points within the city of Lagos, with the intention to add more with time (LSG, Filed Document).

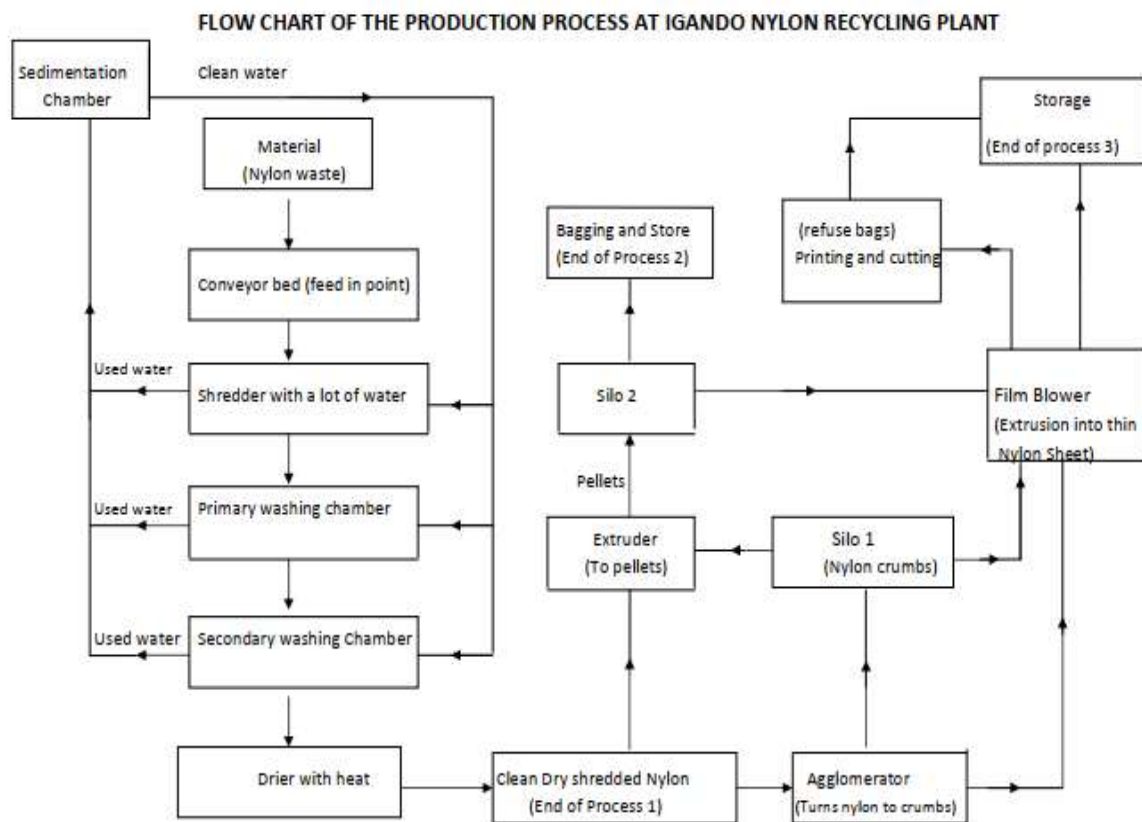
As initially arranged, one of the commercial banks in Lagos by way of cooperation agreed to bankroll the payment for the recovered nylons. However, it was gathered that after about two months, the bank backed out and it was rumoured that the quantities of recovered plastic nylons were overwhelming for payment. It was also claimed the bank officials suspected that there was manipulation of figures. Due to the failure of the arranged payment plans, the programme experienced a setback. Nevertheless, some individuals took the opportunity of the

situation to act as middlemen by buying from the plastic gatherers, accumulating them and selling the bulk to the processing companies (LSG, Filed Document).

To ensure that the recovered nylons were put to use, Lagos State Government built plastic pellets producing and plastic extrusion plants at Olusosun and Solous dumpsites. A similar one was established by the association of pure water producers that was situated at De – Robin Water’s compound in Ojo LGA, Lagos. The flow chart of the plant at Solous dumpsite is as shown in Figure 2.17 as designed and operated. Pellets were made and sold, trash bags were produced, printed, cut to sizes and distributed for use in the state. Unfortunately, for some reasons, they all died a natural death.

Figure 2.17

Flow Chart of Production Process at Igando Nylon Recycling Plant, Lagos



Prepare by : Akinwale Adesina, Lagos State Plastic/Nylon Waste Recovery Department, Ministry of env. Lagos Nigeria . 2010
All right reserved to Lagos State Government

Note. Adapted from LSG – MOE, filed document

One of the outcomes of plastic recovery that Lagos embarked on were plastic and nylon pelleting, cleaning and bailing of recovered plastics ready for selling or transported for other plastic production plants in Nigeria or for exportation. Figure 2.18 shows one of the government's owned facilities with products for further processing.

Figure 2.18*Baled Recovered Plastics and Products*

Note. Adapted from *Progression in waste management processes in Lagos State, Nigeria*, Olukanni and Oresanya, 2018.

Figure 2.19*The Abandoned Lagos State built Plastic recycling Plant at Igando*

Note. Self – taken photograph

The Inspection of the abandoned Lagos State built Plastic Recycling Plant at Igando, Lagos by a team of Officers from Lagos State Ministry of the Environment on the 9th of September, 2015.

Apart from the nylon and plastic buyback programme, organized residential estates were encouraged to do sorting from the houses with dedicated trucks to pick the recoverable materials like plastics, glasses, and metals (Olukanni & Oresanya, 2018). More so, recoverable or recyclable waste banks were constructed by LAWMA and distributed to government establishments, parks and gardens to collect plastics among others for recycling (Adenaike & Omotosho, 2020). In the same vein, Lagos State Ministry of the Environment in her school advocacy programme was engaging pupils in school recycling competitions with the provision of recyclable receptacles (Figure 2.20).

Figure 2.20

Sorting Receptacles for Glass, Plastic and Papers



Note. Adapted from *About us. Lagos Waste Management Authority, LAWMA, 2020.*

A Materials Recovery Facility (MRF) was built and commissioned at one of the closed dumpsites in Solous, Igando by West African Energy in cooperation with the Lagos State Government (Figure 2.21). The MRF was configured to treat comingled waste and materials recovered included paper, plastics, glasses and metals. The MRF at Igando is operating epileptically, when it does operate, it is far below the installed capacity. According to Adenaike

and Omotosho (2020), the acclaimed MRF built by the State Government at Mosimi, Lagos, never existed.

Figure 2.21

Material Recovery Facility at Igando, Lagos



Note. Self – taken photograph of material recovery facility at Igando, Lagos where plastic recovery was given great priority, September, 2015.

Plastic Waste Management by the Informal Sector in Lagos, Nigeria

Officially, there is no formal and working municipal solid waste recycling programme instituted by the government of Nigeria (Salami et al., 2018). Where such programmes once existed partially and constituted without appropriate policy frameworks like in Lagos, it can neither boast of functioning accordingly. Plastic recycling among other waste recovery programmes is often initiated, but somehow, they faded out unannounced or are dead before arrival in some cases. Major waste materials recovery activities for recycling purposes are carried out by the informal sectors in Lagos and the entirety of the nation (Mbah & Nzeadibe, 2017).

The people who participate in the recovery of waste materials for recycling purposes usually do so because they can make a living from such activities, not that they had the interest of helping to sustainably manage the environment or the resources (Egun & Evbayiro, 2020). Such, were referred to as the informal sector in solid waste management and their activities are usually unregulated (Nzeadibe & Iwuoha, 2008). Though the intention is to eke – out a living, somehow, they are contributing to resource conservation/management. The informal sector in this case of informal recycling has to do with any form or part of waste recovery/recycling carried out by waste scavengers, recovered material processing or transformation, packaging or bailing, buying and selling of recovered material by the end users (Omosimua et al., 2020; Awopetu et al., 2014). The waste scavengers are the main drivers of the informal recycling system in Lagos and most cities in developing nations (Wilson, 2007). Hence in some scholarly literatures, these scavengers represent the most seen phase of a larger industrial recycling system in Lagos, Nigeria (Nzeadibe & Iwuoha, 2008), though, they have different types of waste pickers at different rungs in the organizational hierarchy.

Type of Waste Pickers

The waste pickers in Lagos are mostly male, though there is presence of female participation in the recent times, especially at the dumpsites and event centres. Their classification is based on where the scavengers collect the waste materials, how they go about it or whether they also collect full waste streams before picking what they needed.

The dumpsite scavengers usually operate at the State – approved dumpsites in the State, where they upturn waste dumped already to select materials of their choice. The majority of these types of waste scavengers live in and around the dumpsites in makeshift structures built from materials recovered from the dumpsites. These types have made the dumpsite their dwelling place and some even marry and raise their children in such places (Awopetu et al., 2014) despite all government's effort to stop them from inhabiting the dumpsites.

The itinerant scavengers in Lagos move around the city picking recyclables that they come across from house to house. In some cases, they pick from waste in residential dustbins. Some of the itinerant scavengers walk around residential areas with sound making instruments to call the attention of residents to bring out used materials or individually salvaged materials to buy from them (Omosimua et al., 2020). Of recent practice, is the sight of women and children at event centres picking plastic bottles and empty cans of drink.

The third type is the cart pushers, they move about with cart constructed to push collected waste of all types. This type collects waste from residents and are paid for service rendered. As they collect the waste, they select what they can resell. This type of scavenging is also practiced by compactor loading labourers usually referred to as motor – boys (Nzeadibe & Iwuoha, 2008).

Network of Informal Plastic Recycling in Lagos

Some of these waste pickers have already – made customers to buy the recovered materials from them. At the dumpsites where the majority of the recovery takes place; there is an existing network that makes up the informal recycling system with some kind of organizational structure. The informal plastic recycling system in Lagos comprises of the waste pickers of all types of recyclables, the middle men (who buys directly from the waste picker), small and medium – sized enterprises (SME) that use the recyclable materials for manufacturing. There could be middlemen at different levels, some do not buy directly from the waste pickers as they buy in larger quantities to either export or sell to the industries. The plastic waste pickers at the legal dumpsites have union and executive committee members, making it compulsory for members to pay dues. Only those belonging to this union can pick plastic waste at the dumpsites. The plastic waste buyers are organized in such a way that new entrants must follow laid down procedures in order to participate. Though, those who are involved in the informal plastic recycling system in Lagos, do so for the purpose of economic

reasons, however, their activities have positive and negative consequences (cf. Nzeadibe & Iwuoha, 2008).

Advantages of Informal Plastic Waste Recycling System

The informal plastic waste recycling system provides means of livelihood for the participants. It is established to be an economically viable business and provides employment for a great number of individuals (Burcea, 2015; Linzner & Lange, 2013).

By recovering plastic waste from the environment, the waste recycling system and their activities contribute to environmental sanitation and conservation (Burcea, 2015).

They provide raw materials to industries (Burcea, 2015), thereby helping to contribute in the reduction of the demand of virgin infinite natural resources from which plastics are made.

By recovering plastic waste for reuse, they contribute to prolonging the life of dumpsites (Scheinberg et al., 2010).

They are drivers towards the production of more locally recycled goods and the much – desired plastic economy circularity (Burcea, 2015).

Disadvantages of Informal Plastic Waste Recycling System in Lagos

The environment from which the materials are recovered like the dumpsites are not conducive and unhealthy for humans (Owusu – Sekyere, 2014). The hazard and risk exposures are on the high side as most pickers do not wear protective gears. The contracted diseases can be spread to the city as they intermingle with outsiders away from the dumpsites

In Lagos, the activities of the waste pickers at the dumpsites are illegal and as such, they are carried out with flagrant disobedience to the law of the State (Nzeadibe & Iwuoha, 2008).

Waste Management Transition to Circular Economy

Plastic waste arises from different sources, but there exists a form of broad grouping that classified them into two major groups, that is, post – industrial and post – consumer sources. The emphasis is placed on the post – consumer plastic waste, which happens to be

mostly generated in municipal solid waste streams and their management poses greater challenges. Common with the latter are the thermoplastic products that are polymers in the likes of polyethylene (PE), polyethylene terephthalate (PET), polypropylene (PP), and polyvinylchloride (PVC) (Horodytska et al., 2019).

It is already established that the present linear system of plastic waste management in developing countries (Pujara, 2020) is unsustainable and brings about environmental pollution and economic loss among others. About 75% of the world plastic littering is said to have come from developing countries and the need to change the management strategies to a more sustainable ones have also been emphasized (Kehinde et al., 2020; Horodytska et al., 2019). The majority of adverse effects arising from the linear economy of plastic can be significantly minimized by recycling the plastic waste materials and transitioning to the Circular Economy of plastic.

To maximize the benefits of plastic recycling while minimizing the adverse effects of plastic waste, there must be institutionalized and working waste collection and sorting systems to begin with. After waste recovery, the initial stages of the recycling processes entail material grinding, their washing, drying and the granulation (Horodytska et al., 2019). The plastic Circular Economy model does not only concern reuse and recycling of plastic material, but also the designing and production of plastics that will enhance maximization of recycling and aim towards a zero – waste situation in a mimicry to a healthy natural ecosystem. When the end of product's service life is reached, certain action in preferential order is recommended to be taken for plastic in the sought Circular Economy model are the maintenance of items, reuse of materials after their initial or primary end – of – life, refurbishment, and recycling. In order to maximize the benefits in plastic waste recycling, it is suggested that closed – loop mechanical recycling and upcycling should be adopted (Horodytska et al., 2019). Figure 2.22a and b show

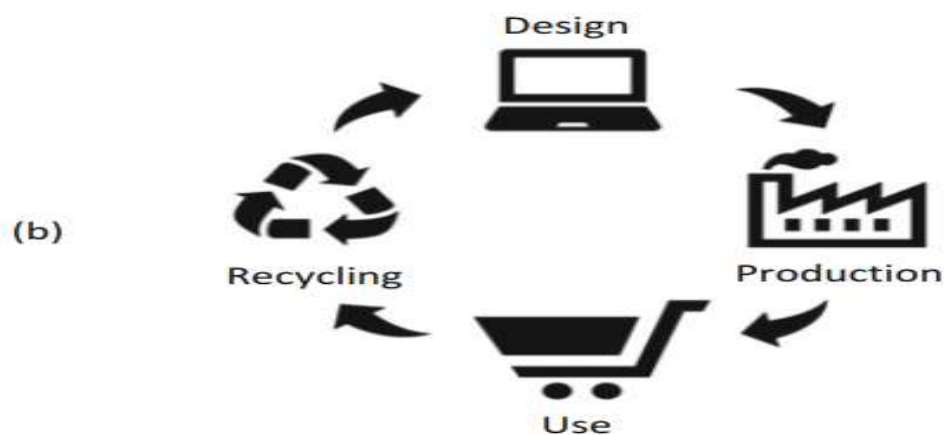
the current plastic linear economy model and the recommended Circular Economy model to transit to.

Figure 2.22

Simplified Schematic Drawing of Linear Economy Model



Note. Adapted from *Plastic waste management: current status and weaknesses*, Horodytska et al., 2019.



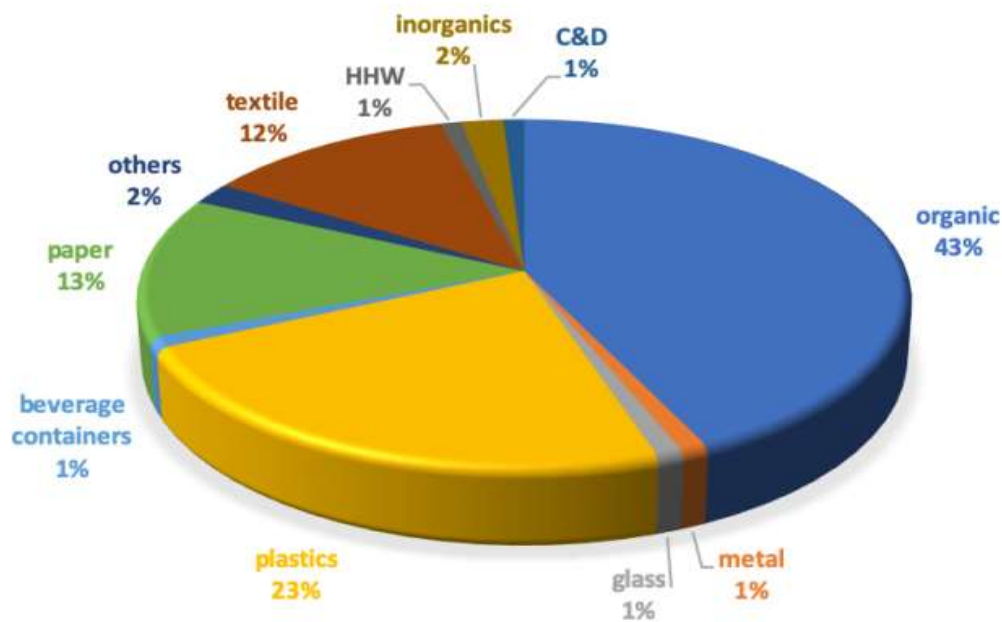
Note. *Plastic waste management: current status and weaknesses*, Horodytska et al., 2019.

Nigeria is claimed to generate over 32 million tonnes of solid waste annually. An estimated 1.3 million tonnes of this are the fraction of plastic waste generated in Lagos alone by its 22 million inhabitants (Naijalink, 2020) generating waste stream of which 23% is plastic as indicated in Figure 2.23. Unfortunately, only about 10% of the plastic is recycled. The good side of the matter is that with recycling in practice, a sizeable amount of income can be made while the former adverse effects associated with the Linear Economy model will be minimized.

It is calculated that increasing the recycling rate to about 50% could generate about US\$ 250 million dollars for the industry as returns according to Holland Circular Hotspot (HCH, 2020). Apart from the financial benefit, other benefits such as social, ecological among others are associated with the recycling and transitioning to the Circular Economy of plastic

Figure 2.23

Percentage of Waste Fractions by Weight in Lagos Waste Stream



Note. Adapted from *Nigeria circular economy 2 – pager*, Holland Circular Hotspot, 2020.

The Circular Economy as the name implied is an economic model that is aimed towards prolonging the use of resources in order to have the maximum extraction of value from the resources as it is being used. It is inclined to systems thinking with innovation as the central focus, to bring about continual material flow within a value circle involving the major stakeholders, such as the manufacturers, end – users, government and business enterprises (Barra et al., 2018).

Somehow, it could be inferred that the sought – after circularity concept is already being practiced in the land and it is practically done by the informal sector. Instances can be cited of plastic reuse by inhabitants in containing locally or home – made drinks, the use of gin and

wine bottles to package groundnuts (Naijalink, 2020; Barra et al., 2018; Tukur et al., 2012). However, the authors were quick to point out that the Circular Economy needs to rely on policies that uphold and encourage experimentation and innovation, since the circularity of the economy doesn't come spontaneously (Naijalink, 2020).

The success of circularity will depend on the availability of various companies along the value chain of plastic production, use and its waste management, working towards reduction of output and the possible reuse of what is eventually produced. Outside this, detailed purposive sustainable plastic production, consumption and its waste management policies must be formulated and implemented. It is stated that LAWMA is seeking to collaborate with various bodies at the state level to create circularity and enhance possible company alliances towards transitioning to the Circular Economy in the waste sector (Naijalink, 2020). The desire for the development of the Circular Economy is already acceptable in the Nigerian public sector as can be seen from the establishment of Extended Producers' Responsibility (EPR) initiatives. This also could be seen from the nation being one of the first few to register with the African Circular Economy Alliance. Figure 2.24 shows organizations, public and private that are working towards the achievement of the needed Circular Economy in Nigeria with plastic recycling at the forefront.

Figure 2.24

Nigeria's Circular Economy Ecosystem



Note. Adapted from *Business opportunities in Nigeria's circular economy*, Naijalink, 2020.

Plastic Waste Recycling

Two major methods of recycling are the primary and secondary recycling types. The secondary recycling is also referred to as mechanical recycling. Though, other methods classed as pyrolysis/thermal degradation, gasification and catalytic degradation are becoming more pronounced than ever in the recent past (Kehinde et al., 2020). These methods are briefly discussed:

Primary Recycling. This method of recycling is the commonest of all recycling methods and is tagged as a 'reuse strategy'. In the case of this process, the products are reused without the alteration of the original structure of the products. As a measure of the advantage of primary recycling, it is usually very easy to adopt and reasonably cheap. The main disadvantage

of this method of recycling is in the number of cycles that a particular plastic material can be re – used. This method is exemplified in the use of recovered pet bottles to produce similar or near – similar new ones (Kehinde et al., 2020). In some quarters, primary recycling is mentioned as closed – loop recycling that entailed the mechanical processing of recovered waste into the products that have the same properties with the feedstock (Hopewell et al., 2009).

Secondary/Mechanical Recycling. This is a case that entails the reprocessing of recovered plastic waste to generate secondary raw materials without necessarily changing the chemical structure to a high degree, though the products are usually of different characteristics. Mechanical recycling of plastic as the name implies involves recovered plastic waste material recycling through mechanical means that may entail, material grinding, washing, drying, further granulation and compounding. Only thermoplastics can be recycled in this manner (Kehinde et al., 2020; Grigore, 2017; Hopewell et al., 2009). As the materials such as PET, PP, PE and PVC could be reprocessed severally without much alternation of the fundamental structure, they remain the best in attempts to closing loops as in the Circular Economy (Kehinde et al., 2020).

Pyrolysis/Thermal Degradation. This type is majorly applied in the area of waste – to – energy, that is, from recovered plastic waste to generate energy by subjecting the plastic material to different levels of temperature so as to decompose the material for the generation of energy (Kehinde et al., 2020); a process also referred to as thermal cracking (Hann & Connock, 2020). There is a change of chemical structure in this case; as it is sometimes referred to as chemical recycling (Grigore, 2017).

Catalytic Degradation. This is similar to thermal degradation but it differs in the area of the application of catalyst to make a faster and more controlled degradation with a better fuel efficiency as the temperature at which pyrolysis occurrences are reduced. The catalytic method allows for increased selectivity and a reduced resistance time (Kehinde et al., 2020).

Gasification. This recycling method is basically about the generation of syngas. It is about the treatment of recovered plastic materials to the point that the energy stored in solid is converted to gaseous fuel for further re – use (Kehinde et al., 2020; Thiounn & Smith, 2020).

Concept of Households

The Definition of Household

The definition of a household may differ from one individual to another or from one culture to another, hence the need to give a clear understanding of the adopted definition for the purpose of this study (Randall et al., 2015). A household could be a one – person household or a multi – person’s household. One – person household is the situation of a stand – alone, where an individual takes the whole responsibility of his or herself in the provision of feeding and other necessary means of living (housing/accommodation, feeding, etc.) without directly sharing the responsibility with another person and stays alone in a housing unit. While a multi – person household is the situation where two or more number of persons live together with an arrangement for the common supply of food and other necessary means of livelihood (Keilman, 1995). The definition is according to the United Nations’ (UN) recommendation towards the 1980 round of census (Keilman, 1995; UN, 1989).

The definition of household as a socio – economic unit comprising of individuals staying together or an individual standing as a loner bring to the fore some fundamental concepts of households and this concerns ‘housekeeping’ and ‘dwelling units. With housekeeping, resources are pooled together so that every householder can be fed while other basic needs are provided according to available resources (pooled or singularly provided); and concerning the dwelling unit, the householders are housed in a unit dwelling place (OECD, 2016). Usually, the household occupies the entire housing unit, or a part of it or more than one housing unit. A household may occupy a camp, hotel, boarding houses, or even be homeless. So, it could be a domestic household – private or an institutional household (Keilman, 1995).

From far back in the early 1950s, the United Nations (UN) Statistical Division has emphasized on the need of standardization of definitions of concepts that will be used for the collection of data. One of such applicable concepts is the household in terms of censuses and surveys. The household has been a unit for the collection of data, for analysing the collected data and its interpretation; hence its precise definition for any context cannot be over – emphasized as policies are to be formulated on the basis of data collected. In order to standardize the definition of the household, some nations have added some emphasis such as collective food provision, hence eating from a common cooking pot and eating together and being headed by a single household head (Randall et al., 2015; Beaman & Dillon, 2012). The group of individuals living together as a household may or may not be related by blood and may have an adult female or male as the head of the household (Mather et al., 2019; NPC, 2019). With data collection of solid waste management of the household, it is worthy to add that the waste generated from a household is first stored in a common container(s) within the housing unit. The emphasis here is the ‘household waste’ which was defined as the waste arising from the conventional activities of the households and their householders (Dahlén, 2008). For this study, the initial containerization of household waste within the dwelling unit is added to the United Nations recommended definition of household as earlier defined (section 2.6.1).

Households as Major Stakeholders in Sustainable Solid Waste Management

Municipal solid wastes are generated by people’s activities and the person(s) generating the waste may be a single householder or a member of a group of a household living in a housing unit. It is of common practice for the majority of households to have a container that comes in different forms, shape and sizes to first contain the waste within the housing unit at the moments of generation. Hence, the householders are the first handlers of municipal solid waste that they generate. How this initial handling of the waste by the majority of the first

handlers is carried out will go a long way to contribute and determine the outcomes of a sustainable solid waste management plan. The improper handling of household waste is fingered as the major cause of solid waste leakages that causes all kinds of pollution and subsequent outbreaks of diseases among others (Odonkor et al., 2020; Khan et al., 2018). The starting point for municipal solid waste management value chain begins with the householder(s) whose role is very important to the success of the downstream management sector. Each household has specific waste disposal practices which members of the family holds on to in handling the generated waste and it determines their waste management habits.

To avoid the generated waste from posing health and environmental challenges, it is essential that appropriate inhouse waste management practice is inculcated among all members of the household. Therefore, to have a successful waste management plan, the support of the households in the community is greatly needed. Being the largest stakeholders in the municipal solid waste management chain (Okorie & Amadi, 2017), household roles are very important in bringing about waste reduction at source, waste separation and waste recovery (Noufal et al., 2021). According to Agbesola (2013), household are the major solid generators in Lagos. Delgado et al. (2019) asserted that in developing countries, households contribute the most to the urban solid waste generation (cf. Datta, 2022). They (Degado et al., 2019) corroborated that so long as households remained the principal generators of urban solid waste, any intervention strategies proposed must win over this major stakeholder in MSWM. More precisely put, UN-HABITAT (2010, p.25) stated that, “in terms of proportions, household waste accounts for usually up to 75 percent of all the municipal solid wastes” in developing nations. Abdel-Shafy and Mansour (2018) in their studied that was carried out in 22 developing countries, spanning across four continents, asserted that about 55 – 80% of the MSW generations are from the households (cf. Jayasekara & Dinugala, 2019). The majority of the municipal solid waste in cities are generated from household kitchens (Bello, 2018).

A good solid waste management plan must first of all be able to collect generated waste; otherwise, it is bound to fail. If the households refused to release their generated waste to the rightful collectors, this can hamper the achievement of the aims of the sustainable management programme (Odonkor et al., 2020). Kotei et al. (2020) in their study carried out on the stakeholder participation with respect to sustainable SWM using SWOT Analysis in Ga West Municipality of Accra, Ghana identified ten (10) important stakeholders. One of the identified major stakeholders that is of interest to the present study is the households. They did stakeholders analysis to better understand their roles, possible responsibilities, as well as their influencing power in the matter. The household influence in achieving sustainable management of municipal solid waste cannot be over – emphasized in the present dispensation.

The trending globally acceptable solid waste management practice focuses more on waste prevention at source, recycling, recovery and safe disposal of unavoidable waste generated (USEPA, 2020; Abdel-Shafy & Mansour, 2018). The aforementioned activities are better handled by humans beforehand than mechanical equipment after waste comingling. Therefore, when solid waste management's operational efficiency is sought; it is pertinent that the residents and the local authorities effectively participate in the programme. The participation of residents should not be limited or seen to only be the end user of service provided but should be participants in the decision – making process, creation of awareness within and around the community which are parts of the socio – cultural aspect of waste management. These will enhance a maximum contribution towards finding lasting solutions to the existing waste management problems within the communities (Noufal et al., 2021).

There is a care – free common attitude (Babalola & Akpomuje, 2020) in most developing countries with respect to municipal solid waste management. Waste management is seen as the sole responsibility of the municipalities while the public are often taken as observers that do not need to contribute anything apart from following the last order of

municipal authorities on the subject. However, in order to significantly improve any waste management system of a place, especially with the low – income nations, it is very much essential that the major stakeholders are fully engaged (Adeolu et al., 2014). Thus, the need for the stakeholders to transit from mere onlookers to being part of the organizing and planning groups to play roles in the phases of programme designing, planning, implementation and participating in the real act in order to improve the MSWM systems of the area is paramount.

Achieving sustainability in the area of municipal solid waste management does not happen spontaneously (see Section 2.5.5), it has to be worked towards. It is therefore necessary that all useful hands must be on deck with the recognition of individuals or group interests, their roles and the existing structure with respect to general solid waste management. It is established that, where municipal solid waste management practices are making headways, are places where collaboration among stakeholders are existing. The collaboration amongst stakeholders such as government authorities, service providers and users, private sector participants, NGOs, donor agencies, among others will help drive towards the achievement of sustainability of solid waste management as it is capable of helping to reorient people's attitude for the better and also enhance the financial responsibility sharing towards a common goal for the benefit of all (Noufal et al., 2021). The degree to which stakeholders participate in a proposed waste management programme can either make or smear the programme.

Households may hinder or facilitate Plastic Waste Sustainability Management Practice

The households are the largest group generating MSW and the majority of stakeholder in the sustainable management of municipal solid waste programme (Okorie & Amadi, 2017). It is claimed that for developing nations, about 55 – 80% of municipal solid waste is generated by the households and this is followed by market waste (Abdel – Shafy & Mansour, 2018). Householders are the first handlers of waste in the MSWM chain, the role played by the householders could either support to enhance the achievement of set goals or on the contrary

can be a barrier to sustainability achievement. For example, plastic wastes have high recyclability potential and this potential can be down – graded when the plastic is joined with other waste streams that could further contaminate the plastic outside the initial content's contamination (UNEP, 2020; Abdul – Rahman, 2014).

The whole – hearted participation of households in sustainable solid waste management will lead to some benefits such as, reduction in the general quantity of waste generated and increase in the rate of waste materials recovery. The majority of the processes in the circular economy of plastic waste concerns recycling. The buzzword for sustainable solid waste management is recycling but the detailed approaches are in the three Rs: i.e., reuse, reduce and recycle (Abdul – Rahman, 2014) as briefly described:

Waste reduction is about being proactive rather than reactive as one may decide to buy things only when they are needed for use. In other words, waste can be reduced by not creating waste. Where plastic waste is not generated, there will be no need for resource extraction as raw materials as with the current ever – rising demand for more production from scratch. A reduction in household waste means reduction in waste management problems. As goods consumers, some steps can be followed to reduce waste, which are differentiating between what the householder needed from what they wanted; buy more quality materials to last longer with lesser problems and as such, no need to discard with ease; minimization of plastic packaging materials and the more purchase of local products that help in boosting the local economy and reduce negative environmental impacts resulting from the transportation of the goods (Abdul – Rahman, 2014).

Reuse as the name indicates, entails the use of material that has already been used for its primary purposes. The reuse of materials comes with the understanding that materials that comes to us for use can be taken as resources after use rather than seen as refuse that is meant to be discarded. Instead of managing waste, the households will be managing resources

(Adzawla et al., 2019). Intent searching can reveal that the former throw – away materials can be used to solve some problems around us and meet certain needs (Abdul – Rahman, 2014).

With recycling, it is advised that instead of throwing waste away and the waste ending up in the landfills, effort must be put in place to recycle waste (Abdul – Rahman, 2014).

The activities of the householders to reduce, reuse, recover waste will definitely be needed for recycling to take place at optimal level. However, where a householder decides not to participate in the three Rs, it is difficult to achieve sustainability in the management of solid waste in the particular community/state/country. It is established that for municipal plastic recycling optimization, there must be householder's participation in waste sorting at source (Rousta et al., 2020). It is tantamount to saying that where recyclables are sorted, it takes the participation or agreement of the householders to bring forth the recyclables for collection and onward delivery to recycling enterprises. There are ways that householders participate with the collection of the recyclables towards the achievement of circular plastic waste economy.

Main Ways that Households Participates in the Collection of Recyclables

Depending on the obtainable collection arrangements, it takes the efforts of the households to get the recyclables to the point where they needed to be collected through any of the following means:

Curb Side Collections: In this type of arrangement, it is required that after the householders might have participated in waste segregation in their housing unit, they are also required to bring out the well and specially containerized recyclables to the curb on agreed days for collection.

Drop – off Centres: This involves the construction of waste banks within the community where the householders can go and drop such recyclables on the designated waste banks.

Buy – back Centres: In this case, the householders have to take the recyclables to centres where the operators will exchange them for cash or gift items (Abdul – Rahman, 2014).

Scavengers Pay for Recyclables: In this case as is observable within the study area is where recyclable scavengers collect recyclables from house to house and pay as they collect from the householders.

Globally Acceptable Practices for Plastic Waste Management

The best acceptable practice for the sustainable management of plastic waste is recycling that will decouple economic development from environmental pollution of plastic production, use and management of generated plastic waste. However, the plastics are produced for different purposes and used in different forms: some have additives that does not encourage recycling. To avoid these types of situations, it is recommended that the producers must factor in the end – of – life reprocessing or management in the production process. This practice is more often considered where the Circular Economy of plastic is at work or is being worked towards. Charity, they say begins at home and a good Circular Economy of plastic can be reached only where the citizen fully participates in the planned sustainable management of solid waste. It is therefore worthy to look into some reasons why some stakeholders do not participate wholeheartedly in sustainable solid waste management.

Issues Hindering Households from Participation in Sustainable Solid Waste Management

Perception and Attitude: Most householders have different understanding concerning what waste is to them. The scavengers for instance see waste as valuable materials from which they can make their living. Though their participation in waste recovery and recycling is borne out of the desire to be financially empowered not because they understood the benefits of waste separation and environmental protection (Noufal et al., 2021). Where waste is taken for trash, it is often thrown away as quick as possible as it is believed to be a burden that must be handled that way. This is the mindset and practices of most developing nations. This wrong system of perceiving and managing waste in most cases is compounded by social norms, desire for convenience by doing what is most convenient rather than what is right (Adeolu et al., 2014).

Lack of Sense of Responsibility: It is most often believed that the responsibility for waste management is totally on the purview of Municipal Authorities. The people in most developing countries are not carried along in the decision – making part of planning for sustainable solid waste management programmes, so they believe that whatever happens does not concern them. For them, even complaining is not necessary as they believe that authorities will not listen and their complaints will not change the situation (Strydom, 2018). However, it is worthy to mention that this attitude varies within different socio – economic status or groups. The wealthier group show more concern and are more ready to participate in finding solutions to environmental problems. Some scholars claim that the lower – income set of households are concerned with shelter, food and other basic necessities of life rather than the thought of the wellbeing of the environment (Noufal et al., 2021).

Educational Awareness: The lack of education and the basic awareness regarding the adverse effects of waste management practices contribute to actions of the individuals or householders (Babalola & Akpomuje, 2020). The level of illiteracy and ignorance does hamper the degree to which householders may wish to participate in sustainable solid waste management programmes. A situation compounded by an uncivil attitude of dumping waste indiscriminately with the mindset that municipal authorities will do the needful (Adeolu et al., 2014). Some may have been aware of sustainable solid waste management, but lack the knowledge of the advantages therein in the practice (Debrah et al., 2021).

Command – and – Control: The command – and – control management approach applied in most developing nations contributes to the reasons why some households would refuse to participate in the transition management process towards the achievement of sustainable solid waste management. Even with the use of command – and – control approach, enforcement to ensure compliance is often lacking (Babalola & Akpomuje, 2020).

Inadequate Facilities Provision: In a study conducted in Nigeria, it was claimed that one of the reasons why households often decline to fully participate in sustainable solid waste management programmes is that there is lack of provisions of necessary facilities that the programme may require for the households to use in compliance to the programme. For instance, the needed receptacles or recyclables waste banks may be too far from the reach of most households and some citizens are not ready to walk such distances (Babalola & Akpomuje, 2020).

Waste Management Training and Education

Solid waste management is a portion of general environmental management. Where solid waste is managed properly without commensurate prevention of other polluting actions, still leaves the environment not conducive for humans and other organisms. Biblical record has it that man was made from the soil, man explored the earth to farm, harvest and mined the environment for inherent resources and to the same earth, every living thing will return to one day. It is pertinent that the environment is well taken care of so as to continually sustain life in a conducive manner. The sustainable management of waste has a lot of benefits which some households might not have knowledge of and hence may not be interested in participating because of the perceived burden in its procedures (Khan et al., 2018).

Just as it is agreed that charity begins at home, also it is believed that hygiene should start from the home. Hygiene starts from the household as a unit of family or group of people or single person living in a housing unit. In most developing nations, creation of opportunity towards making the communities to be aware of the dangers inherent in improper solid waste management is hardly established or taken as a priority. More so, even the basic steps that the citizenries needed to carry out towards proper solid waste management are not taught or made available. Most householders usually learn from the actions or instructions of the older householders. Had the needed awareness been created, it would have gone a long way in

reducing waste at source by maximizing every available means towards avoiding waste generation and therefore contribute to the enhancement of effective waste management and the protection of the environment (Khan et al., 2018).

Since households generate the largest amount of municipal solid waste, capturing the households to practice proper in solid waste management practices through the creation of awareness on a simple process to do so in the context of the society will curb solid waste mismanagement. It is therefore necessary that massive environmental advocacy is carried out to intimate the young minds of the current environmental concerns for better orientations to influence or enhance the creation of more environmental wellbeing. To be well – acquainted with the existing environmental problems, education on that aspect is very key (Khan et al., 2018). The householders must be made to be aware of environmental problems resulting from their daily activities in order for them to play some roles that will enhance the achievement of sustainable solid waste management within the community to the general advantage of all (Fredrick et al., 2018; Khan et al., 2018).

Education is one of the most probable ways to inculcate knowledge in people that could eventually lead to attitudinal changes with skill development that is needed to bring about transformation in the communities, like in the aspect of resources management that involves solid waste management (Ifegbesan et al., 2017). To promote sustainable development, the education of the citizens is very important (Debrah et al., 2021), since it helps to boost the citizenry's capacity in contributing towards finding lasting solutions to developmental and environmental issues (Fredrick et al., 2018; Adeolu et al., 2014).

Attitude might not really be changed through simple education but it is established that education is often interwoven with attitudinal change. To meet up with the ever – changing dynamic realities of life, people are engaged in the adoption and adaptation of attitudes of interest as well as doing away with some attitudes they consider as no longer fashionable

(Fredrick et al., 2018). However, it is presented that educating individuals or a group of people does not often directly manifest in their acting properly or show of organizational action improvement, but yet, education remains one of the surest paths to improving human desire to work towards environmental protection (Liao & Li, 2019; Fredrick et al., 2018).

In order to optimize the benefits of sustainable solid waste management, countries are applying cost – reducing and conservation methods that aims at reduction in waste generation, reuse of materials that usually would have been thrown away, recycled to reduce the use of virgin resources and conserve natural resources. This is being done through the education of the communities, including the consumers and producers. Johannesburg, Cotonou, Cairo, Dakar and Bamako are examples of places that have succeeded in using aggressive education of the populace to achieve improvement in waste management. Some of these programmes started in the mid – 80s till date while some others like Nigeria that started almost at that time under the banner of monthly environmental sanitation (Fredrick et al., 2018) are still struggling increasingly with difficulties to manage the generated waste.

Literature Review - Summary

Like most cities in developing nations, Lagos is still battling to overcome the problems associated with the ever – increasing volume of municipal solid waste generated by the inhabitants. A situation attributed to the rapid urbanization, industrialization, population explosion, inappropriate waste management policy, lack of total implementation of existing waste management policies, the use of command – and – control method of administration in a democratic set – up, unwillingness to change by most citizens from the unsustainable practice of waste management, inadequate funding of the sector, general poverty levels of most inhabitants that are more concerned about what to eat and where to live as a priority, non – inclusion of the households in the planning stages of municipal solid waste management programmes, among others (Aliu et al., 2014). It is inferable to surmise that Lagos metropolis

is locked – in to an unsustainable solid waste management culture; a problem classifiable as wicked and a persistent environmental challenge (Parrot, 2017; Duckett et al., 2016) that could be overcome through sustainability transitioning in the municipal solid waste management practices (Lazo & Gasparatos, 2019).

The sustainability transitioning process to curb wicked environmental problems like municipal solid waste management does not augur well with command – and – control approaches (Kemp & Loorbach, 2006). Certain theoretical frameworks and concepts have been recommended to be applied in such situations (Duckett et al., 2016). In this study, Transition Management Theory (TNT) and Circular Economy (CE) concept of municipal plastic waste management have been selected as guides to the study. These guiding frameworks are theories or concepts that experts in certain fields of study have proven to be effective towards the tackling of peculiar kind of challenges. Theoretical frameworks are like blueprints of planned construction to a research plan (Adom et al., 2018; Grant & Osanloo, 2014). The theoretical framework gives the researcher the opportunity to make sense of the information retrieved in specific research and helps in the justification of claims made from the study (Kivunja, 2018). To make right choices of a study's supporting framework, it is pertinent that the researcher is very clear and succinct concerning the problem(s) being researched, research question(s), purpose(s) of the research and the main significance of the research. The aforementioned research components must be aligned accordingly to enable the selection of correct research methods and the analyses of the data gathered (Grant & Osanloo, 2014).

Transition is a societal change that comes gradually but are continuous in nature as a result of transformation in the structure/character of the society in question. The changes may take place at varied societal levels/areas of the economy, technology, behaviour, belief system, and institution, among others. Transition Management Theory deals with the management of such societal changes towards the achievement of selected societal sustainability variation(s).

The emphasis tilts towards system innovation and supports the ideas of learning – by – doing and doing – by – learning in a reflexive manner (Kemp & Loorbach, 2006; Rotman et al., 2001).

The Circular Economy (CE) concept is a variant of the concept of Sustainable Development that emphasizes the decoupling of development from environmental degradations (Fogarassy & Finger, 2020). One of its major tenets is to close the unsustainable linear metabolism of resources to make a closed loop, where by – products/waste from one process can be used as feedstock for another process (Valenzuela & Bohm, 2017; Leusbrock et al., 2015) instead of being viewed as waste meant to be disposed. As a trending concept, developing nations have been encouraged to apply the concept in order to enhance economic growth with the attendant reduction in ecological footprints (Preston et al., 2019).

The best possible and globally acceptable ways to minimize the ecological footprints of households in Lagos, Nigeria with respect to the use of plastic products and the arising plastic waste management is sought for in this study. The extant plastic waste management practice in the study area has been classed to be unsustainable with attendant social, economic and ecological adverse effects (Dumbili & Henderson, 2020). Concerted efforts have been made by the Government of Lagos State to tackle the menace arising from municipal plastic waste mismanagement but to no avail (Adenaike & Omotosho, 2020). Though there are many reasons given for the failure, one of the major reasons, was the non – consideration of the households in the planning stages, since they are the largest stakeholders in the State in municipal solid waste generation (Rai et al., 2019) and they are the first handlers of the household generated waste (Abila & Akintola, 2020; UNEP, 2015).

For a waste management plan to be successful, it must have the support of the community members that will have to participate actively in the programme. Households being the largest stakeholders in municipal solid waste generation and the waste management value

chain, they have prime roles in the area of avoiding the generation of waste, waste sorting at source, waste volume reduction, increasing the rate of material recovery, the proper containerization of household waste, release of whole/sorted waste to right pickers, avoidance of waste leakages, pay for waste service charges, among others (Noufal et al., 2020).

Households have long been used as units for data collection and analysis in attempts to formulate policies in order to curb some societal problems (Nyariki, 2009; Keilman, 1995). As a unit for data collection, United Nations (UN) Statistical Division has since a long time ago advised that the definition of household should be standardized for a specific study. The study adopted and adapted the UN recommended definition (Keilman, 1995) to suit the tenets of this study. It is already established that a household could be a one – person household or a multi – person's household living in a dwelling unit (OECD, 2016), cooking and eating from a common pot and the household generated waste is initially containerized in a common waste receptacle during the time of generation within the dwelling unit (Randall et al., 2015; Beaman & Dillon, 2012). A one – person household takes care of his/herself alone while a multi – person's household pool resources together where necessary for the basic needs of the householders and is headed by an adult male or female (Mather et al., 2019; NPC, 2019).

One of the major reasons for doing literature review that is in tandem with this research, is to assist in answering some research questions (Torraco, 2016) as it concerns the topic of study. A proper structuring of the literature review will enhance the answering of the research questions in a thorough and appropriate manner. The thematic or conceptual literature review structure seems more appropriate for the study at hand, since the research will be using the concept of household as a unit for data collection, while the concept of Circular Economy and Transition Management Theory will be the guiding frameworks. This will enhance the maintenance of clarity and coherence of purpose in literature review and in the field work (cf. Tarraco, 2016; Randolph, 2009) concerning municipal plastic waste matters.

The definition of waste is dependent on the value a person puts to it (Ogbodo, 2009). In a sustainable waste management thinking manner, waste from a process should be looked at as resources for other processes, where the materials will serve as feedstock or reused for useful life elongation. Along with this line of thinking, people will no longer manage waste but manager resources (UNEP, 2015; Wilson & Velis, 2015).

Waste dumping or land filling is the major or most used method of solid waste management worldwide (Hoang & Fogarassy, 2020). Countries in the Southern hemisphere are battling with the collection of generated wastes in the cities (Bello et al., 2016; UNEP, 2015). However, the trending and globally recommended practices are not focused on waste collection but on the prevention of waste generation and its reduction from sources. Thus, putting aside the end – of – pipe management approach and clinging on to preventive approaches and proper treatment of any unavoidably generated waste in a sustainable resources' treatment manner (Singh et al., 2014).

In treating waste sustainably, a 'one – size – fits – all' does not exist, due to waste stream peculiarity for various locality. Hence, the need for each locality to fashion – out their waste management plan built in a context specific way (UNEP, 2015) like this study intends to contribute towards with respect to the household's sustainable plastic waste management transition.

Due to population explosions, it is forecasted that 66 megacities will exist worldwide in 2030, and that the majority of the new entrants to the megacities will be from Asia and Africa. The implication is that, municipal solid waste generation in the cities of Asia and African continents will double around 2030 (Wilson & Velis, 2014). Unfortunately, in these regions, the waste recycling rate is estimated to be between 20% - 30%, and this is majorly carried out by the informal sector (Wilson & Velis, 2015; Wilson et al., 2013). This matter

needed the serious attention of the authorities concerned for immediate action(s), especially with the plastic contents of the waste streams.

Like with the case of Lagos, general waste characterization for Sub – Saharan Africa showed that the average of plastic waste content is about 13% which is second to organic waste (Babayemi et al., 2018) that is around 57% (UNEP, 2018). It is claimed that around 32 million tonnes of plastic waste were mismanaged globally as at 2010 (Babayemi et al., 2019). It is also surmised that the production, consumption, generation of plastic waste and plastic waste mismanagement will be on the rise if nothing is done to curtail it sustainably (Babayemi et al., 2019; Lebreton & Andrady, 2019; Kaza et al., 2018).

Though the mismanagement of plastic waste in Lagos, Nigeria may be seen as a local environmental challenge, but it has a global dimension (cf. Ortiz et al., 2020; Dutta & Choudhury, 2018). About 79% of plastic of the total plastic produced till 2016 are currently lying at the dumpsites/landfills or within other environmental media (Ortiz et al., 2020).

It is stated that Nigeria is the first in Africa (OECD, 2018) and the ninth worldwide in the mismanagement of plastic waste (Jambeck et al., 2015). It is claimed that Lagos, Nigeria contributes about 450,000 tonnes of plastic waste to the ocean yearly (Dumbili & Henderson, 2020). The challenges associated with the mismanagement of plastic waste have been in the forefront of most international discourse in the recent times (Alabi et al., 2019; Godfrey, 2019; Narancic et al., 2018;). Circa 75% of plastic waste littering takes place in developing nations and the need to put a stop to the phenomenon is being emphasized worldwide (Kehinde et al., 2020; Horodytska et al., 2019). Regions have been advised to put together measures to prevent further pollution arising from plastic production and plastic waste mismanagement (Babayemi et al., 2019). Plastics have high recyclability rates and this advantage can be taken to sustainably produce plastics and manage the plastic waste arising from human activities from its use.

The review revealed that one of the more globally acceptable ways to sustainably manage plastic waste is to transit from linear to circular plastic economy (Drzyzga & Prieto, 2018) through innovations and experimentations, though it is not easy to bring about (Naijalink, 2020). The majority of those involved in plastic recycling in Lagos are from the informal sector and the drive is to make ends meet and not about the sustainability of the environment and its resources (Egun & Evbayiro, 2020). This sustainability innovation that is already springing out in society can be escalated and steered towards the desired direction by applying the Transition Management Theory (Loorbach et al., 2017; Kemp & Loorbach, 2006) towards the circularity of plastic in line with the Circular Economy concept. In this regard, the households needed to be studied to get their opinions, know their beliefs, attitudes and behaviours among others; so as to decipher how they can be integrated into the management plans to play sustainable management roles in order to enhance the achievement of sustainable municipal plastic waste management state in the study area.

The current plastic waste management practices in the study area are unsustainable according to available information and personal observations. The authorities responsible for managing plastic waste have made several efforts to turn away from the unsustainable practices but to no avail. The acknowledgement of the adverse implications of the practices is understood while the need to transit to sustainable management is sought. Yet, the society remained socio – technically locked – in to the wrong practices. The plastic waste mismanagement in the study area has been claimed to have resulted from cultural behaviours, wrong waste management approaches and the non – integration of the major stakeholders in the management plan. An Integrated Municipal Solid Waste Management (ISWM) approach that put the Circular Economy concept of plastic into consideration is recommended as one of the strategic ways forward. Some of the tenets of ISWM approach are the inclusion of major stakeholders in all

phases of sustainable solid waste management processes from planning to execution and a subtle but effective societal behavioural change.

Though the buzz word seems to be plastic recycling, but in the recent trends of waste management hierarchy, recycling is in the third positions on the list of management priority. The waste prevention approach stands in the highest priority list and is followed by re – use. Where the waste is not generated, there will not be a need to manage it. These two approaches of sustainable waste management take place usually before the products' end – of – life phase is reached. Recovery and disposal are the least favourable options in this regard (Bartl, 2014).

Plastic recycling on its part contributes to the reduction of primary resources consumption, but a critical look at the processes therein reveals that it only helps in tackling the symptoms and not the causes of the actual consumption problems. Energy consumption is involved in recycling processes and waste is also generated as by – products since several barriers exist that could hamper the achievement of 100% recycling. The underlying principles for waste prevention and re – use tackle causes in addition to symptoms, hence holds a different philosophy from that of recycling. It is established that a reduction in waste generation will result in the reduction of primary resources consumption, decrease in the amount of money needed to process waste, as well as reduction in energy consumption. However, it is sad to say that waste generation is a positive indicator for economic growth of a given society (Bartl, 2014). Therefore, proffered solutions to plastic waste management challenges will have to know and handle the interests of all the major stakeholders in waste generation and management businesses. Furthermore, there is a need to marry plastic recycling with the several basic principles of waste management in the rungs of the waste management hierarchy at different portions as the context may demand. These will enhance the decoupling of economic growth from the generation of waste and the sustainable management of the unavoidably generated plastic waste.

CHAPTER 3: RESEARCH METHODS

Introduction

Taking clue from the definition of ‘Sustainable Development’ as presented by the Brundtland’s report on Agenda 21 of the United Nations’ Conference on Environment and Development (UNCED) of 1992 in Rio de Janeiro, ‘Sustainable Municipal Solid Waste Management’ could be defined to mean the waste management type that results in ecological, social and economic benefits (Giurea et al., 2018; Permana et al., 2015) within where it is practiced and contribute towards the good of the global environment (Thole, 2018). However, this is not the case with extant solid waste management practice in most African cities such as Lagos, the current study area. What is obtainable rather has serious adverse effects on the environment, the economy and the society in general (Bello et al., 2016; Oteng – Ababio et al., 2013). The existing practice portends danger and the need to proffer workable solutions to the problem is very necessary (Maiyaki et al., 2020; Abila & Kantola, 2013).

The lack of capacity among other challenges to properly manage generated waste usually leads to the waste constituting environmental nuisances (Ojelola et al., 2020; Ojewale, 2019). Of prominence in the solid waste fractions of Lagos is the plastic waste of all sorts, of which their generation is on the rise uncontrollably and the inability to manage it sustainably, subsequently constitutes hell of nuisances in the State as observed by previous studies (Adekomaya & Ojo, 2016; Kehinde et al., 2020). Plastic waste pollutants in focus are the land – based macro – plastics. The plastic waste generation arises from its daily uses as plastic bags, single – use plastic such as food packages for takeaway, cups, cutleries, straws, among others. The common plastic types are made of non – biodegradable elements and they have adverse effects on the physical environment (Dumbili & Henderson, 2020; Edoga et al., 2008) when not well managed.

Households are major generators of municipal solid waste (Olukoju, 2018; Johnstone & Labonne, 2004) in residential communities. The generated solid waste becomes a problem

as a result of mismanagement of the generated waste (Ferronato & Torretta, 2019). In aiming to avoid generated waste from becoming a societal problem, it is seemingly wise for the generator's role to be fully considered and integrated in the waste management system to curtail waste leakages from in – house management amongst others.

Nigeria has been ranked ninth in the global pollution of the sea as the country contributes between 0.13 – 0.34 million tonnes of plastic waste to the marine environment. Furthermore, of this amount of plastic waste reaching the ocean, Lagos contributes about 450,000 tonnes per annum (Dumbili, 2020). On a daily basis, Lagos is acclaimed to generate about 2,250 tonnes of plastic waste and less than 10% of the plastic waste generated in Nigeria is recycled while the remaining might end up being unsustainably managed with potential loss of multi – billion Naira in the process (Ojewale, 2019).

This study has become very necessary as several solutions previously proffered to achieve sustainable management of plastic waste in Lagos have failed to address the problem. One of the reasons for this is as a result of non – consideration of the households in the waste management plan. Where households did not buy – in to the municipal solid waste management programme, it will be difficult to record tangible success. It is believed that the suggested and hitherto implemented solutions were too technologically focused rather than seeking solutions that are more human – based (Abila & Kantola, 2013; Afangideh et al., 2012). Major tenets of sustainability management and the circular economy concept of resources requires that the society treats resources in some stipulated ways to achieve the purposes of the concepts. Some of these tenets include but not limited to the following: controlled consumption, avoidance of waste generation, reduction of waste at source, re – use, recovery, waste sorting at source, plastic metabolism loop closing, proper storage and disposal of generated waste (Geissdoerfer et al., 2016; Leusbrock et al., 2015; Ogbazi & Ezeadichie, 2014). It is reasoned that these fundamental tenets of the concepts will be difficult to achieve without the buy – in of the

households who are the main generators of municipal solid waste and the first handlers. Furthermore, success in this regard may be compromised if the households do not buy – in to the ideas or are not carried along the value chain of solid waste management plans in the study area.

Hence, the purpose of this mixed methods research (Almalki, 2016; Doyle et al., 2009) is to investigate into how the households have contributed to the extant unsustainable plastic waste management and therefore through the findings contribute towards deciphering how they could be integrated into the sustainable plastic waste management system to minimize plastic waste leakages toward achieving sustainable plastic waste management in Lagos, Nigeria. The guiding frameworks are the Transition Management Theory (Loorbach, 2010) and the concept of Circular Economy (Preston et al., 2019; Mrowiec, 2018; Valavanidis, 2018).

This chapter dealt with the research approach and design; giving reasons why they are selected and the design steps to be taken. More so, the population and sample of the research study were discussed with elaboration on the population (as appropriate), estimated size and relevant characteristics with appropriate support. In the same vein, materials/instrumentation of research tools with emphasis on reliability and validity of selected tools were looked into and ethical issues were further discussed in the section of Study Procedures and Ethical Assurances (Section 3.6). How data was collected in the study was also covered and the analytical processes for the gathered data was described in full while the use of software where the need arises for data processing was attended to.

Research Approach and Design

In order to select appropriate research approach and design, it is necessary to look at the nature of the study that was carried out. This build on the consolidating efforts to gather data that will respond wholesomely to the research questions raised in the study.

Nature of the Study

The study on the contemporary social phenomenon of solid waste mismanagement in Lagos, Nigeria was carried out in its natural setting as it occurs, no manipulation was carried out on the research participants, or any process of the research. Purposive sampling was engaged in some quarters in order to get some specific information (Mohajan, 2018) that only some few correspondents might be privileged to have. The data capturing process relied more on face – to – face interviews in order to retrieve in – depth information from respondents and enable the digging deeper into some emerging knowledge. The study made meaning from what the correspondents have experienced and brought to the fore at discussion times (Hoe & Hoare, 2012). The foregoing is an indication of a research tilting more to a qualitative case study (Baxter & Jack, 2008) that is rooted in the philosophical worldview of interpretivism (cf. Kivunja & Kuyini, 2017).

This therefore means that the construction of human experience can easily be carried out using qualitative research method (Hoe & Hoare, 2012) and cannot be done adequately using the quantitative research method only since it doesn't answer the how questions significantly well. The research questions were determinant factors in determining the methodology applied in a study (Kamil, 2004).

Interpretivism as a philosophical worldview run almost in counter to sociological ideologies inherent with positivist research (Thompson, 2015). The interpretative research paradigm endeavours to ensure that subjective experiences of human beings are admitted as a way of knowledge validation. It is geared towards finding out the drive behind every action, event, phenomenon in a sociological arena by way of attending to singular matters as a reference point of view. Some of its tenets are subjective epistemology; socio – technological construction of multiple realities; application of inductive approach to data analysis and these data are often verbally retrieved (Thompson, 2015; Chowdhury, 2014). Hence, the method most often times generates qualitative data (Rehman & Alharthi, 2016). Qualitative

tools/instruments of data collection such as face – to – face interviews, observations, Focus Group Discussions (FGDs) to gather in – depth information; for both spoken and unspoken words are most commonly applied (Kabir, 2016).

However, in order to get a snapshot of certain information from participants in the study area with respect to their opinions, behaviours, knowledges, attitudes, beliefs, among others on the need for sustainable plastic waste management, one time survey was carried out using self – administered close – ended questions (Hyman & Sierra, 2016) in questionnaire administration. The involvement of close – ended questions in a questionnaire administration draws in the instrument associated with quantitative research method (Kabir, 2016). Where the behaviours, attitudes or opinions of certain groups of people needed to be defined, descriptive research like this comes handy using predefined categories of choices to be made by the respondents that will end up providing data that will give descriptive statistics of the studied population. These will give room for the measurement of the findings on the overall study population. In this case with a descriptive design, descriptive statistics (percentages, mode, mean, median, standard deviation) was employed to measure the spread of the data within the study population (Hoe & Hoare, 2012). However, quantitative research method may be able to take succinct snapshots of the phenomenon under investigation but as a limitation, it cannot be used to acquire in – depth information as it does not recognize subjective experience of correspondents from their daily life (Rahman, 2016).

Specific research questions have to be matched with a befitting research design in order not to undermine the quality of the research project (Cronje, 2020; Asenahabi, 2019; Jackson, 2013; Draper, 2004). In order to critically examine the opinions, attitudes, beliefs of the populace towards plastic waste management, a one – time survey was carried out using a structured questionnaire to help establish baseline information (Cheung, 2014; Roopa & Rani,

2012; Glasow, 2005). The involvement of qualitative and quantitative research methods in a single research study is referred to as mixed methods research approach.

Mixed Methods

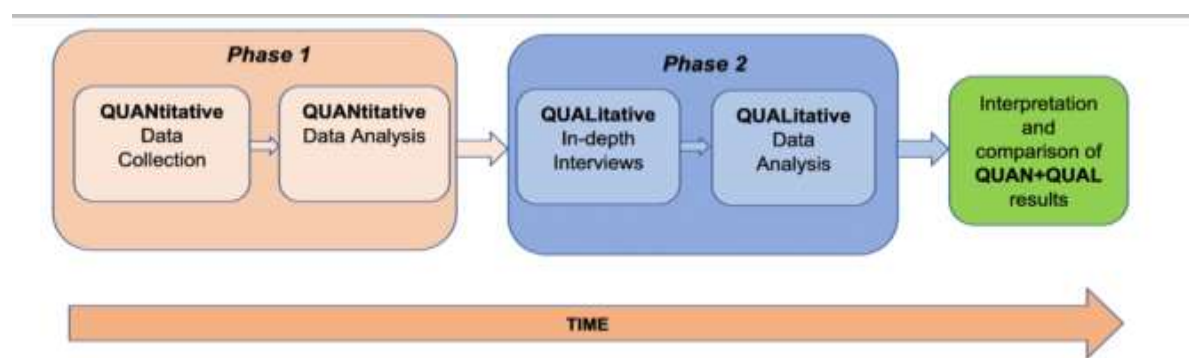
Mixed methods research approach as the name implies is a research method that combines the paradigm procedures of qualitative and quantitative approaches, in order to strengthen the understanding of the study's social phenomenon. It generates much more refined evidence when compared to the single methods (Wariri et al., 2020). The method utilizes quantitative and qualitative data in a single study and the two approaches complement each other by drawing strengths of the approaches. Complex phenomenon of everyday life experiences can better be understood using the mixed methods approach that takes up the similarities inherent with each of the paradigms, while taking the advantages of the aspects where they differ in a complementary way to produce rich information (Wariri et al., 2020). In this approach, the order in which the data is collected may differ; hence, there are variants, which can be sequential or concurrent mixed methods (Creswell et al., 2004). Johnson and Onwuegbuzie (2004) described this research approach as the third paradigm that has become the bedrock of social sciences in the quest to get great and deeper knowledge of human's everyday life experiences. Before the legitimization of the use of mixed methods research approach as a means of knowledge generation within human and social sciences, researchers were restricted to specific paradigms. The use of mixed methods has brought about the removal of these restrictions as researchers can now draw from the strengths of the two paradigms to get a more robust understanding of the social phenomenon of study (Bowen et al., 2017).

This mixed methods research approach entailed the triangulation of data collection and data analysis (Brink, 1993). The research design is the mixed explanatory sequential design that entails the use of qualitative research to facilitate results of the initial quantitative findings. The initial data collection was quantitative by way of survey through the administration of

questionnaires with structured questions to find out the perceptions, behaviours, opinions, attitudes of the sampled population on solid/plastic waste management. This first strand of the research involved the use of a survey with closed – ended questions – a quantitative design that is cross – sectional in nature and questionnaire – based. The second strand that happens to be a follow – up to the first phase is qualitatively designed, set to gather primary in – depth data from interviewees using semi – structured interview schedules. The result from this quantitative strand was used in preparation of the qualitative strand of the study. On the issue of when to apply mixed explanatory sequential design, Creswell (2014), asserted that it is necessary when one needs to have a better or more detailed understanding of the phenomenon understudied by using qualitative data collection strand as a follow up, in order to get better explanation of the data of the quantitative phase of the study, such as the survey data. Data collection in the second strand of the research was through interviews with semi – structured and unstructured interview schedules in interviews with individuals and FGDs (cf. Kabir, 2016). Figure 3.1 depicts the explanatory sequential design with an initial strand of quantitative process followed by a qualitative section.

Figure 3.1

Sequential Explanatory Mixed Methods Design



Note. Adapted from *What will my child think of me if he hears I gave him HIV?: A sequential, explanatory, mixed-methods approach on the predictors and experience of caregivers on disclosure of HIV status to infected children in Gombe, Northeast Nigeria*, Wariri et al., 2020.

One main reason for the triangulation is to try to circumvent or reduce the possibilities of biases as may be brought into the study by the researcher(s) and a concerted effort to overcome the weaknesses inherent with single – method study. By doing this, the validity of the study is increased (Brink, 1993). In this case, quantitative data was collected and analysed while the second strand entailed the qualitative data collection and analysis. The two strands were given necessary or almost equal priority, but the main idea is to use or to elaborate quantitative results by further exploration of some results in a more detailed pattern for clarity purposes and generating themes of understanding and explain the phenomena understudied. One example is the follow – up with interviews on a face – to – face basis for the in – depth understanding of quantitative results. One of its weaknesses is that it is time consuming; however, it has the advantage of being straight forward as a result of the clear and distinctive stages involved when compared to other mixed method variants (Terrell, 2012). The use of persuasion in qualitative research is a big plus as it allows for gathering of rich descriptive knowledge which gives the possibility for a strategic comparison of retrieved information across cases, which results with being able to overcome the inherent abstraction predominant in quantitative studies and as such, allowing for the generalization to theory (Malina et al., 2011).

Suitable Research Design: - A Case Study Design

The research design suitable for the study is a ‘case study’: a research design that is usually contextual (Hancock et al., 2007). The study looked at the case of municipal plastic waste management with a focus on the role of households in aiding transition to sustainable management of municipal plastic waste in Lagos. The study population was treated as one entity. To be a case study, it has to be ‘system bounded’ – with clear research objectives, be specific concerning the focus and the extent of the research (Kumar, 2011; Creswell, 2007). Baxter and Jack (2008, p.545) stated that a case study is usually applied when and where:

The study is focused on answering the ‘how’ and ‘why’ questions; which is the case with the study at hand that intends to find answers to how the households have contributed to the extant mismanagement of plastic waste, why have the already proffered and implemented solutions failed, amongst others.

Where the behaviour of the research participants cannot be manipulated; for example, in the current study, where there was no manipulation of the behaviour of the respondents in their attitude towards plastic waste management. The study phenomenon was studied in its natural state.

When one chooses to understudy contextual conditions on the ground that they are seen to be relevant to the phenomenon under study.

Where the boundaries between the phenomenon and context is not very clear (UK Essays, 2018; Baxter & Jack, 2008).

A case study can either be qualitative or quantitative but in most cases, they are predominantly qualitative like the case at hand that was carried out in real – life setting (Jackson – II et al., 2007). Case study research could be used for in – depth investigation of contemporary phenomenon in real – life context (Yin, 2009). To adequately retrieve in – depth data on the phenomenon of interest, appropriate data collection tools must be selected.

Population and Sample of the Research Study

The data collection for the study was carried out in two phases. The first one involved the use of questionnaires in a cross – sectional survey to get a snapshot of selected niche’s opinions, behaviours, attitudes, practices among others while the second phase or strand of data collection was done through face – to – face interviews of different sorts.

Survey Sampling

Lagos State is made up of 20 Local Government Areas (LGA) as officially recognized by the Federal Government of Nigeria (FGN). Sixteen of these LGAs make up the Lagos

Metropolis where the data for the study was collected; while the remaining four (4) LGAs are considered as the rural or sub – urban areas of Lagos (Onilude & Vaz, 2021; Ayeni, 2016). The exact population of Lagos State has been controversial. For instance, FGN's census of 2006 claimed that the population of Lagos was 9.1 million people (Ayeni, 2016), whereas, an acclaimed parallel census conducted the same year by Lagos State Government (LSG) claimed Lagos was 17.5 million people in 2006 (Filani, 2007). UN (1999) reported that Lagos being one of the fastest growing megacities in the world will have an estimated population of 23.2 million inhabitants in 2015. UN (2011) projected that by 2025, Lagos will have a population of 18.8 million. Nigerian Bureau of Statistics (2017) estimated that the population of Lagos would have been 12.6 million in 2018. On the other hand, the population at Ward level is practically unavailable if they do exist.

Amiss these contradictory population figures of Lagos, it is really difficult to determine whether a sample from a given population is a true representative of the total study population. The alternative sampling technique to random sampling is the non – probability sampling technique that is even becoming more popular as a result of internet enabled surveys and the Covid – 19 crises (Fernandes et al., 2020). Where the paucity of the larger population figures becomes an issue, then non – probability sampling techniques become the viable option. It is very useful in situations where the intention of the researcher is to see whether a specific phenomenon needed further in-depth investigation and to check whether certain features or trends are inherent in a sampled population. In this case, the views arising from a targeted niche are sought, either as a result of their location and or similar characteristics/classification. Those meeting these criteria becomes the target sample; for instance, based on socio – economic classification of dwelling areas, the participants were selected. Hence, knowledge of the characteristics of the sample population must be known beforehand for the hand distributed questionnaires.

Table 3.1*Sampling Strategy for Self – Administered Close – ended Questionnaire Survey*

3 Lagos	LGA	Number Of Selected Wards		Number	Of
Districts				Respondents	
West	Ikeja	No.	3 Wards		
		a.	Ojodu/Agidingbi/Omole (HI)	25	
		b.	Oke-Ira/Aguda (MI)	25	
		c.	Ipodo/Seriki Aro (LI)	25	
Central	Surulere		3 Wards		
		a.	Adeniran/Ogunsanya (HI)	25	
		b.	Aguda (MI)	25	
		c.	Shitta/Ogunlana Drive (LI)	25	
East	Kosofe		3 Wards		
		a.	Isheri-Olowo-Ira/Shangisha/Magodo Phase II (HI)	25	
		b.	Ikosi Ketu/mile 12/Agiliti/Maidan (MI)	25	
		c.	Owode Onirin/Ajegunle/Odo-Ogun (LI)	25	
3 Districts	3 LGAs		9 Wards	225 Respondents	

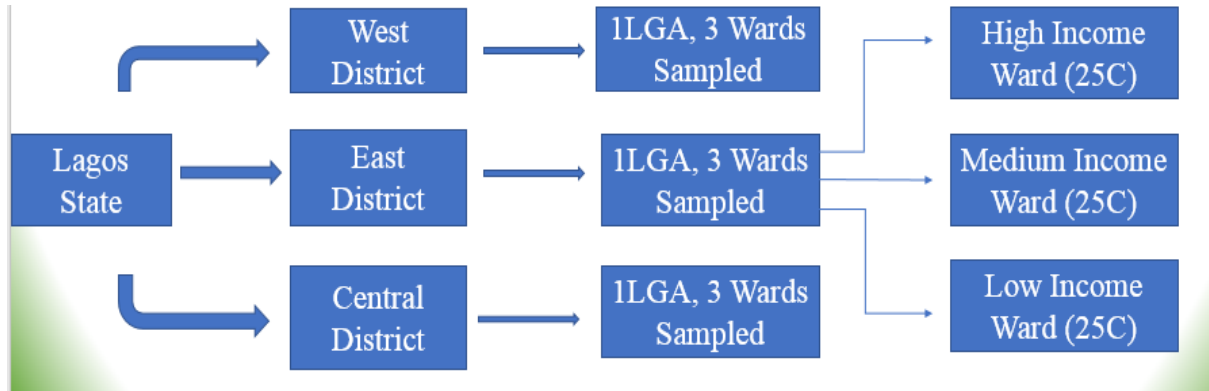
For the purpose of drawing samples, Lagos was stratified following its political delineation into three Senatorial Districts (Oyedele, 2019) which are, Lagos Central (Surulere, Apapa, Eti – Osa, Lagos Island & Mainland Local Government Areas – LGAs), Lagos East (Shomolu, Kosofe, Epe, Ibeju – Lekki & Ikorodu LGAs) and Lagos West (Agege, Ifako-ijaiye,

Badagry, Ojo, Ajeromi – Ifelodun, Amuwo – Odofin, Oshodi – Isolo, Ikeja & Mushin LGAs) (Samuel, 2021; Oyedele, 2019). One Local Government Area was picked from each District and sampling wards selected as shown in Table 3.1.

These LGAs were further divided into Wards for ease of voting. These Wards have in most cases visible social stratification based on socio – economic factors and is classified into highbrow/High – Income area (HI – exclusively rich) Middle – Income (MI – middle class) & the Low – Income area (LI- the poor) for the purpose of the study. From each District, three wards were sampled as HI, MI and LI areas. For the self – administered questionnaire, 25 participants from each socio – economic stratum were sampled. Three Districts, each having three selected wards of 25 participants. Total of 9 wards, 25 participants each to arrive at 225 participants. A diagrammatic representation is as shown in Figure 3.2.

Figure 3.2

Diagram of Survey Sampling



Note. Self - developed

Sample Size Calculation for Study Area (7 155 920 = 2023 Registered Voters)

Using the official voters' registration of January, 2023 in Lagos which was reported as **7 155 920** representing **three (3)** Senatorial Districts which have **twenty (20)** Local Government Areas (LGAs).

The average population per Local Government Area is therefore calculated as **7 155 920/20 LGAs = 357 796**

The study purposively selected three LGAs with one LGA representing one Senatorial District of the three Senatorial Districts that make up Lagos.

One LGA was selected from each Senatorial District. Therefore three (3) LGAs were selected to represent the study sites which resulted in an average of 357 796 people X 3 LGAs = 1 073 388 as a population size.

The following parameters were utilized in calculating the sample size:

Table 3.2

Parameters used to Calculate Sample Size

Parameter	Respective Values
1. Population	1 073 388
2. Confidence Level	90%
3. Margin of Error	5%
4. Population Proportion	30%
5. The z-score ($\pm$)	1.52

The equation for calculating sample size is shown below.

$$\text{Finite population: } n' = \frac{n}{1 + \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2 N}}$$

Where,

z is the z score

ϵ is the margin of error

N is the population size

$\hat{p}$ is the population proportion

Therefore, this means the sample size will be 229 or more measurements/surveys at a confidence level of 90% that the real value is within $\pm 5\%$ of the measured/surveyed value.

From each selected LGA, three (wards of different socio – economic strata were selected: - High Income, Middle Income and Low Income). Therefore, the sample size for each LGA was calculated as $229/3 = 76$ people per LGA.

For each Local Government Area, the sample population was $76/3$ socio – economic strata ≈ 25.33 people per ward.

Therefore, the overall sample size generated was 225 people in the study using convenience sampling technique.

It is worthy to mention that the face – to – face administration of the questionnaires was solely carried out by the researcher as the researcher was not allowed to recruit external personnel for data capturing. More so, the data capturing exercise was carried – out during the era of Covid-19 pandemic when the authorities advised that efforts should be made to minimize person – to – person contacts. These affected the number of respondents engaged and the pegging of the population proportion at 30% (see Table 3.2) in calculating the sample size using the equation for a finite population. More so, it was reasoned that quantitative and qualitative research methods were deployed to help complement each other. Studies on capturing opinion, culture, attitudes etc. of households towards improvement of SWM have been conducted in some cities in Nigeria, hence the results of such findings were also used as auxiliary information to match trend of this study's finding of the survey strand (see Section 3.5).

Non – probability or convenience sampling technique which does not involve random sampling when drawing sample from a larger population was deployed. The main feature of this type of sampling is that the subjective judgement of the researcher plays a major role in the sample selection as the onus lies on the principal researcher to decide the units of the

population to be included (Chen, 2020; Ayhan, 2011). In this case, though the researcher may have a greater control of the selection process, it is limited in the sense that the power of generalization of the findings to the larger population is reduced (Tansey, 2007). When non – probability sampling is deployed, it leaves some members of the population with lesser or unknown opportunity of being selected. Five major types of non – probability sampling approaches are used in research and these are: purposive, quota, convenience, snowball, and self – selection (Galloway, 2005). For the survey, convenience sampling was applied while purposive sampling was used to draw participants for the interviews (for both individuals and FGDs).

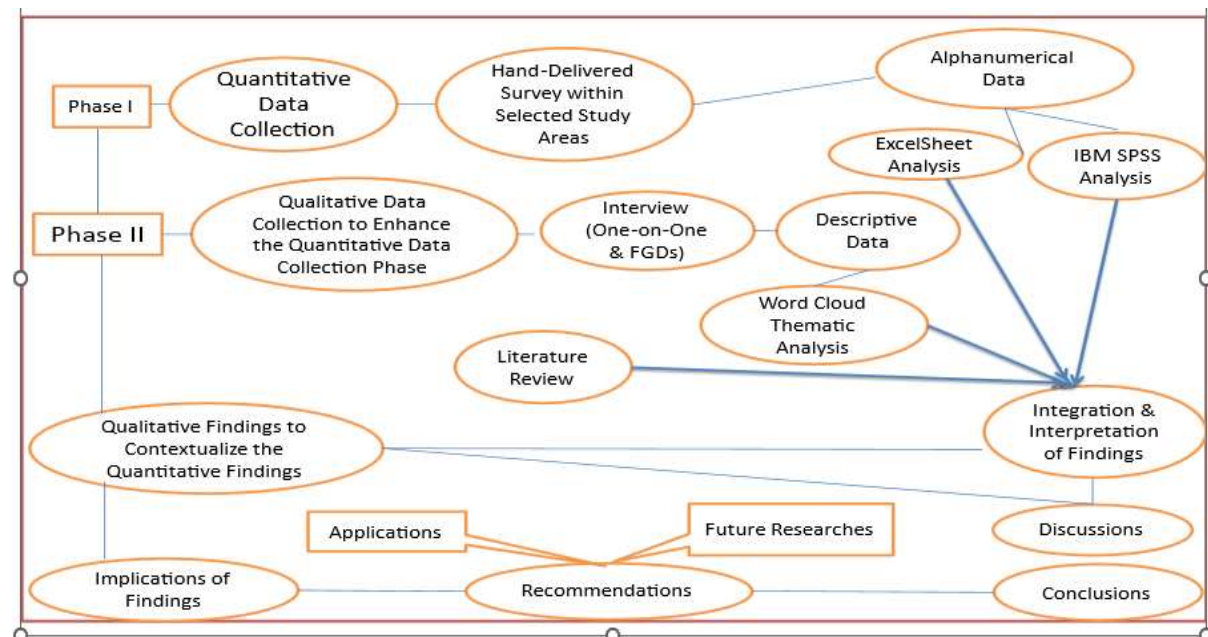
Convenience Sampling (also known as availability or accidental sampling) involves the researcher picking the most available respondents based on an already set criteria. In this study, the respondents must be residing in the selected sampling area, are aged between the 18-70 years and not visually impaired. The sampling continued until the planned sample size was reached. There are no strict selection rules/process and convenience is its major advantage as well as allowing for the sample to be drawn in the easiest way by the researcher. Since there are no selection rules, it is difficult to tell or say to what extent the larger population is represented by the sample population. However, for the collection of data using the non – probability sampling method, it is necessary to consider the use of some important variables like age, gender, socio – economic status among others that could help provide the tendencies to participate as well as acting to be predictors for the response variables (Chen, 2020).

In order to accurately describe events, phenomena, or situations, descriptive research will be needed as its techniques allows for the determination of the actual social condition of a study population. Through descriptive research, the characteristics of the study population could be determined. It involves data collection, summarization and interpretation to give meaning to the collected data but it is difficult for use in predicting the relationship between or

among sets of data. It becomes convenient when the need for the development of the community arises with the intentions to use needs assessment or evidence – based approaches (Bowen et al., 2017). The schematic representation of the study process is as shown in Figure 3.3.

Figure 3.3

Schematic Representation of Research Process



Note. Self – developed representation of Mixed Explanatory Sequential Process

Surveys on community level are very important in an effort to describe the extant socio – economic situation, document the opinion of members of the community and determine the needs in order to intervene, so as to improve the community’s situation and even find out how best the community feels on whether the intervention will work – out or not. Non – probability sampling techniques have merits and de – merits in their application.

Advantages and Disadvantages of Non – probability sampling

The advantages of non – probability sampling (Chen, 2020; Ayhan, 2011; Galloway, 2005) are noted as follows: -

One of the advantages is its usage in a situation where there is no sampling frame as the details of the total population is not known.

The problem with low response rates in randomized sampling is eliminated.

It could provide descriptive details of the niche population.

It is quick to carry out and cheap as compared to the randomization technique.

Its findings can further be expanded upon.

Considering its applicability in the online survey, the sampling technique is faster, easier and not restricted by physical geography.

Possibilities of real – time reaction is enhanced.

The disadvantages of non – probability sampling (Chen, 2020; Ayhan, 2011; Galloway, 2005) are as follows: -.

The most disturbing disadvantage is the high risk of the introduction of sampling bias that might arise as a result of not giving equal or fair opportunity/chances for some members of the study population to be selected

Scaling up the results arising from non – probability sampling is difficult

The Interview Sampling

Purposive sampling strategy was applied to select interviewees for the interview section. Purposive sampling entailed the researcher selecting the sample based on his/her knowledge of the population as a guide to the selection with respect to the aim of the research. The researcher picks the sample of interest based on established criteria as may be related to the research topic (Tansey, 2007; Schreuder et al., 2001).

For the FGD with Lagos State Ministry of the Environment and Water Resources officials, eight (8) senior personnel (minimum of 15 years on the job) were purposively selected as they are known to be of vast knowledge with respect to solid waste management policy formulation in the State.

From Lagos Waste Management Authority (LAWMA), Five (5) senior officials were interviewed. The officers were drawn from various departments as their work relates to solid waste management while some are currently championing the ongoing plastic waste recycling initiatives in the State.

Individual interviews were held with officials of some plastic recycling companies that are presently registered with LAWMA and 10 personnel from different companies were aimed at.

Table 3.3 *Participants Selection for the Interviews (FGD and Individuals)*

Table 1 **Table 3.3** *Participants Selection for the Interviews (FGD and Individuals)*

No	Activities	Number Participants
1	FGD with MOE & WR Officials	8 Person-FGD
2	Individual Interview of MOE & WR Officials	7 Individuals
3	FGD with LAWMA Officials	5 Person-FGD
4	Individual Interview of LAWMA Officials	5 Individuals
5	Individual interview with Plastic Recycling companies	5 Individuals from 3 different companies
6	FGDs with recovered plastic waste merchants (middlemen) at Olusosun dumpsite, Ikeja and Solus dumpsite, Igando	15 (7 and 8 FGDs) Olusosun & Igando Respectively
7	Individual Interviews with Plastic Waste Scavengers at Olusosun and Igando Dumpsites	17 (10 & 7) Olusosun & Igando Respectively
	3 FGDs	28 Participants
	4 Variants of Individual Interviews	34 Participants
	Total No. of Interviewees	62 Participants

Data Collection Tool

The main purpose of the study is to decipher how best the households could be incorporated in the sustainable plastic waste management programme to play certain roles that could aid the sustainability transitioning process in Lagos, Nigeria. Atieno (2009) stated that, the research purpose is a determinant of the type of generated research questions, which in turn influences the research method to be applied and the research approach chosen will fit the nature of data that will be collected.

With the above antecedents, the researcher is of the opinion that the best data collection tools to appropriately answer the research questions was through a more human – to – human interactive data collection process as provided by ‘interviews’ of various types, whilst other necessary information were sourced secondarily. Alshenqeeti (2014) defined interviews as conversations between or amongst partners, which could be extensive, aimed towards gathering in – depth knowledge concerning a particular phenomenon, subject or topic, by which the interviewer could make sense or interpret and make meaning of what the interviewees have brought forth. The used interview types for this research were semi – structured, unstructured interviews and the focus group interviewing or Focus Group Discussion (FGD) of participants.

However, in order to get a snapshot representative of the opinions, beliefs, attitudes, behaviours, practices, among others of the study population, a one – time self – administered questionnaire with closed – ended questions to collect survey responses with limited options for the answers was applied (Ponto, 2015; Mathers et al., 2007). Hence, bringing about the integration of data collection tools into the study that is associated or classed as a quantitative research apparatus (Kabir, 2016). Such studies where a strand of quantitative data collection and analysis are carried out and followed by a strand of qualitative data collection and analysis are referred to as mixed explanatory sequential design (Creswell, 2014). Hence, there was a triangulation of the techniques of data collection/multiple data sources (Alam, 2005) that are as summarized hereafter.

The Survey as a Research Data Collection Tool

A survey in research is a way that is used to collect information from individuals or a group of individuals in the sample population, drawing from their responses to some pre – set questions. In surveys, a variety of methods can be used for the recruitment of correspondents, in the collection of data and the application of different methods' instrumentation. Quantitative or qualitative research strategies could be applied (Ponto, 2015). A cross – sectional survey was carried out, which entailed the collection of data at a specific time from respondents selected to represent a larger population of the study area (Owens, 2002).

Sir Francis Galton (1822 – 1911) was said to have invented questionnaires (Kabir, 2016). The advantages of questionnaires (self – administered) when compared to other survey types is in their cheapness since less effort is needed, as it does not require that the enquirer make much verbal conversation or telephoning. More so, the answers are most times standardized, which allow for simple compilation of data (Kabir, 2016). In its uniqueness, surveys are able to gather data that is difficult or not even available from other sources. With the use of probability sampling technique in survey, it is possible to minimize bias. Since the same question and information is harvested from the correspondents, the measurement carried could be considered to be standardized and used in generalization. Survey data can be used to compliment data from secondary sources (Owens, 2002).

The study at hand used questionnaire with close – ended questions and predetermined options for the correspondents to choose from as answers (Ponto, 2015). Questionnaires are basically a list of questions which could be close – ended or open – ended to which the research participants are expected to give answers to. They can be administered in different ways; such as through mail, telephone, live in public areas, internet mailing, through fax, in an institution/organization (Kabir, 2016; Alam, 2005).

The fundamental aim of large population – based data collection through surveys is to quickly capture information that can represent the characteristics of a large sample of

participants of interest in a given population. Sampling strategies in surveys are geared towards obtaining a sample that can be used to represent the study population. In this case, a subset of the sample is used to forecast the responses of the entire population (Ponto, 2015). However, one major source of concern when using questionnaires as a type of survey has to do with the construction of questions and use of words that may be existing in other types of opinion polls. In this regard, Kabir (2016) rolled – out some rules for the construction of questionnaires.

Fundamental Rules Applicable in the Construction of Questionnaire Items

To forestall reservations held against questionnaire technique in studies, Kabir (2016) mentioned some rules to follow as adapted below:

Ensure that statements used will be the type that will be interpreted in the same or near – similar ways by respondents from varied subset samples of population under study.

The statement used should be such that it will ensure that where correspondents with different opinions exist, they should be able to give different answers.

Negative statements should be avoided as much as possible while positive statements are encouraged.

Assumptions concerning the respondents should be avoided as much as possible.

Put into consideration that all correspondents might not have the same levels of education, so simple clear words or statements that should be comprehensible by all educational levels are used.

Avoid the use of leading and biased questions.

Ensure correct spellings of words, use of grammar and punctuations.

One item per question should be used.

Advantages of Questionnaires

Questionnaire allows for collection of large amounts of data in a short time from a large population at a comparatively cost – effective way.

The use of software package in recent times has led to quick and easier quantification of questionnaire results.

After the quantification of data, findings can be used to measure changes over time and to compare and contrast with other researchers of the same vein.

Following the positivists' ideologies, with quantified or quantitative data, it is capable of being used in the creation of theories or for testing extant hypotheses

Its reliability and validity are not much affected whether it was carried out by a researcher or any number of people.

When compared with other forms of research, the obtained data can easily be scientifically and objectively analysed.

Disadvantages of Questionnaires

It is usually insufficient to understand issues like changes in emotion or feeling among others.

It is not often easy to determine whether the respondent told the truth or not.

The thought of the respondent cannot be easily deciphered.

Respondents may read different meanings into the same question and therefore respond differently.

To the phenomenologist, quantitative research is just an artificial creation of the researcher since limited and unprobeable information are gathered as there are usually no explanations (Kabir, 2016).

Interviews as a part of Research Data Collection Tools

Alshenqeeti (2014) defined an interview as a conversation that could take place between two individuals or more which could be prolonged to allow for an in – depth retrieval of information relating to a specific topic, subject or phenomenon of interest, that allows the interviewer to interpret and make meaning of the subject by what the interviewee brought in to

the interview. There are several ways that interviews can be administered, it can be conducted through telephone, computer/social media or through person – to – person. In a face – to – face interview, the added advantage is the possibility of visual contact which allows the identification of non – responses of the correspondent being interviewed at the moment. In a similar vein, an interviewee can ask for clarification on question(s) which needed further explanation by the respondent (Ponto, 2015). To gather more information from the correspondent, the interviewer may apply the probing principle either on emerging information or clarification on identified body language. However, interviews are time consuming and costly (Ponto, 2015).

Four major types of interviews are often used in the social sciences. These are structured, semi-structured, open-ended or unstructured interviews and focus group interviewing/focus group discussion- FGD (Alshenqeeti, 2014). It is worth mentioning that the structured interview will not be suitable as it does not give the interviewer and interviewee enough freedom to unearth some salient experiences of the interviewee. Hence, the applied interview types for this research were semi – structured, unstructured interviews and the focus group interviewing as briefly outlined below:

Unstructured Interview

In this case, the interviewer has a near – complete freedom on interview structuring, the questioning sequence and the choice of how words are used. The interviewer can at any point in the course of interview formulate questions instantly to further probe into an emerging knowledge or where rich points are brought up (Kumar, 2011; O’Commor & Gibson, 2003). In corroboration with the foregoing, Langkos (2014) asserted that an interviewer may choose to follow – up on an interesting development by requesting for elaboration from the interviewee on different matters as he/she developed interest in the course of the interview.

Semi – structured Interview

The semi – structured interview type is less flexible when compared to the unstructured interview in terms of structure, contents of interview as well as questioning sequences. It allows, like with the latter, for extended probing into emerging rich points. In this regard, Alshenqeeti (2014) stated that semi – structured interviews give the opportunity for the retrieval of in – depth information as the interviewer has the chance of probing further into emerging ideas of interest and the interviewees expand responses in order to answer the probing questions.

In this case, it is recommended to use checklist in order to ensure that discussions do not veer away from the research purpose and ensure that relevant areas are covered (Alshenqeeti, 2014; Langkos, 2014). These interview types will be good for the households to get some snap shots of opinions, beliefs, why certain actions were taken, amongst others, following a near similar pattern using a checklist as guide (Alshenqeeti, 2014).

Focus Group Interviewing

In this interview type, it may involve interviewing about 8 – 10 people together (Kumar, 2011) who are purposively selected on the premise that they are vast in knowledge of the study phenomena even though they may not be a representative sample of the study population (Alshenqeeti, 2014). The FGD was very useful where some group of Government officials were assembled to deliberate on issues bothering on why the households have been neglected in attempts to finding solutions to the problems, the hindrances to the long – sought transition to sustainable plastic waste management. More so, on how best the households could be integrated in the solid waste management programmes to achieve desired goals, among others, in line with guiding principles of ISWM, the Circular Economy, and the Transition Management Theory. It was claimed that, despite the fact that it can be time – consuming, it has found much usefulness in studying complex behaviours/phenomena with lesser cost.

Advantages and Disadvantages of Interview in Research

Advantages of Interview

The advantages of undertaking interviews in researches as adapted from Reddy (2016) are;

With a structured interview, it is more possible to reach out to a larger number of respondents within a short period of time.

With a face – to – face interview, the use of electronic devices can be eliminated and save cost.

It creates more personal and cordial relationship between the interviewee and interviewer.

Growth of confidence increases with time and better information retrieved as an opportunity exists for clarification when the need arises.

Where interviews are administered with unstructured questions, a more flexible environment is created allowing for a refinement of questions for better understanding of the interviewee.

With unstructured interview questions, interviewees are able to give answers in their own word or frame statements in their own understanding.

As a result of the possibility to probe further in a matter during the interview, a deeper validity and originality is achieved with interviews.

Since leading questions are usually avoided and the respondent is given ample time to speak while the interviewer must listen attentively, it creates a situation where the respondent steers the course of the interview. This allows for the interviewee not to withhold vital information.

Disadvantages of Interviews

Where structured interview questions are applied, flexibility is restricted, hence no new questions can be raised.

Quantitative data are usually generated from structured interviews and information retrieved are usually not detailed and the reasons why the respondents might have behaved the way they did cannot be obtained.

With unstructured interviews, difficulties may arise in data collection and analysis. For the fact that flexibility is allowed, higher volume of data collected will consume time in analyzing them.

It can be expensive where the need may arise for the training and employment of interviewers.

One other concern against interviews is the management of respondents' personal information to avoid its misuse.

The possibilities of deviation during group interview are almost certain as a result of the open – mindedness of the questions, hence, considerable time may be lost. Sometimes, the situation does not give room to repeat the question to the next respondent and as such, may bring bias into the study.

Validity of group interview may be questioned as the possibility for respondent to tell lies in order to impress other members is high.

Secondary Data Collection

Secondary data was sourced from relevant peer review journals, government policy papers, files, memos, documents, minutes of meetings, among others, to get further grasp on what exists in this regard and what future plans may exist.

Operational Definition of Variables

The mixed methods approach being a complementary research method allows for unequal attachment of importance to the two separate strands or phases of the study as it is left at the chief researcher's discretion in the course of the study process (Dawadi et al., 2021). The present study may seem to have attached more importance to the qualitative strand of the study. This could be so, as several studies have been carried out on general solid waste management, where opinions, behaviours, attitudes, socio-economic status, demographic characteristic of study populations were determined in surveys using random sampling approaches in Nigerian

communities (Adeoti & Obidi, 2010; Rahji et al., 2009). Rahji et al. (2009) in their study investigated what determinant factors exist that influenced the willingness of households to pay for private solid waste management in the city of Ibadan, Nigeria. Their (Rahji et al., 2019) findings showed that the economic status of the sampled population has a high influence on the willingness of to pay for improved sanitation services within the community. In a near similar study, Adeoti and Obidi (2010) using a random sampling survey looked at how the poverty level is related to preference for improved solid waste management attributes in Asaba area of Delta State, Nigeria. One of the findings showed that those of high income (HI) status, higher level of education amongst others are more willing to be engaged in matters bordering on environment and sanitation improvement activities. Adesope et al. (2017) determined the willingness of households to pay for waste disposal after determining the socio – economic characteristics of sampled respondents and came out with a near similar finding to other related researches around Nigeria that high socio – economic status, education, housing area, among others of households, positively influences the willingness to pay for sanitation services in Lagos, Nigeria. Ezebilo (2013) revealed a similar trend that income, dwelling type, education and satisfaction of respondents of waste service provision are strong positive determinant factors on willingness to pay for improved sanitation services in developing nations.

It is on the premises of the foregoing findings that the survey phase of this study was based, to stratify the selected wards into Low – Income (LI), Middle – Income (MI) and High – Income (HI) areas following the visible dwelling structures and socio – economic classification already existing. The survey, thus did not bother to ask questions of income level but assumed that living in such specific domain should give the respondent the socio – economic characteristics known to be associated with the surroundings. The survey snapshot was intended to see whether this trend holds using IBM – SPSS statistical analysis and excel descriptive statistical analysis on data sets from a non – probability sampling strategy. This

will help to decipher how law makers may be advised to implement formulated sustainable solid waste management policies in the State. Thus, using the aforementioned studies and the results therein as auxiliary information, and statistical matching becomes a relevant technique to forestall selection bias that could arise from coverage and non – probability selection errors. With the availability of probability sampling, statistical matching adjustment, can be used to predict the expected value for a targeted variable in a non – probability sample (Castro – Martin et al., 2020).

Convenience sampling in a non – probability survey study is a cost – effective alternative approach in survey sampling in situations where there is paucity of resources or a lack of reliable sampling frames. The sampling method is not covered by any precise sampling schemes and as such making direct inferences to the study population is hampered. To get valid inferences in this regard, available literatures usually take – up the assumption of the availability of independent probability sampling of the same population. This sample should have variables which can be used as auxiliary data of the target population (Castro – Martin, 2020; Chen, 2020; Valliant & Dever, 2011). Using the inferential procedure of the quasi – randomization approach, the data from the non – probability survey sample becomes the primary sample and the probability survey sample is considered as the reference sample (Chen, 2020).

Variables of Survey Questionnaire

The questionnaire used in the survey data collection were based on well – structured questions with the researcher’s opinions given as options to possible answers to each question. The questionnaire contained four (4) major sections/variables upon which certain information were determined. In all, forty (40) questions were asked around the major sections as summarized below:

Demographic and Socio-economic Characteristic of Respondents

In an effort to get a clue of the demographic and socio – economic characteristics of the respondents, questions were raised relating to some variables like gender, highest educational attainment, position in the household, nature of household and nature of the dwelling unit. Past researches have shown that variation does exist among different socio – economic classes with respect to the sanitation techniques applied in households' management of household waste and the willingness to pay for improved sanitation services (Adetunji, 2014; Ezebilo, 2013). These basic socio – economic characteristics were related to the correspondences of the respondents according to the selected socio – economic strata of areas to get a tinge of forbearances with existing studies used here as reference samples. The demographic characteristics of theirs, might be reasons why the individuals responded the way they did, like education level in some cases is a good determinant of knowledge of the implication of the environmental nuisances to human health amongst others. Ergen and Ergen (2011) stated that education remains the key in order to create environmental consciousness.

Dumbili and Henderson (2020) asserted that socio – economic as well as situational factors do influence behaviour and environmental attitudes toward the reduction of plastic pollution. They mentioned some of these factors to be knowledge, awareness, social norms, values, amongst others which may positively or negatively affect behavioural changes. In essence, the citizens must have knowledge of the problems associated with plastic pollution for behavioural change. Though some studies have shown that it is not just enough to have knowledge in order to bring about behavioural change. In this regard, the next major variable determined was the general solid waste matters.

Knowledge of Solid Waste Generation/Management

This section is concerned with determining the level of general understanding of the respondents' knowledge of municipal solid waste generation within the household level and know how the households' store their waste temporarily if they do. It helped to know the type

of waste containerizations around different strata. In order to achieve and maintain a healthy environment within and outside the households at all time, the generated waste must be well containerized (Oresanya & Olukanni, 2018). The information about the possible generation of plastic waste in the household was asked to identify whether the respondents understood the type of solid waste being discussed and get insight as to how they dispose of the particular waste type. Knowing that one generates a special waste that needed a special treat could be the beginning of behavioural change towards the waste type.

The knowledge of the respondents was looked at to determine how often they use plastic materials and where in the public places they have seen plastic waste within the Lagos metropolis. For those who claimed to have seen plastic waste littering parts of the metropolis, they were further asked if the sights were good, bad, don't know or don't care. The knowledge of the respondents was tested to generally know if they were aware of the environmental problem(s) associated with plastic waste mismanagement in Lagos. Duru et al. (2019) surmised that there is scanty or possibly no data on plastic materials use, collection, disposal and recycling methods with respect to the city population in Lagos. They emphasized that most plastic consumers do not even know the implications of the generated plastic waste and their subsequent mismanagement. Further asserting that there may be a linkage between the people's well – being and how they treat their plastic waste. From another point of view, it is possible to mirror the general culture of a people through the ways that they are able to sustainably dispose and recycle their generated plastic wastes. With the foregoing retrieved, it became necessary to probe into their perception towards sustainable plastic waste management.

Perception and Attitude towards Sustainable Plastic Waste Management

In order to know how best an intervention can be carried out within a community, it is proper to know the perceptions, attitudes, behaviours, beliefs, acknowledgement of the said problem, among others of the people with respect to planned intervention. Hence, how to

engage the community will be deciphered (Colmenares – Quintero et al., 2021). Some of the tenets of the circular economy approach to plastic waste management are in the prolongation of the useful life of plastic material through re – use and recycling of all sorts (Da – Silva et al., 2022). It is stated that plastic waste generation could to a great extent be reduced when the majority of the consumers take up the practice of plastic materials re – use (Duru et al., 2019). The level to which the respondents have the understanding of plastic recycling and whether they will participate or not was also sought. Where they do not participate in plastic waste recycling, it was also important to find out on a general basis why it is so. Having touched on this area, the willingness of participants to take part in sustainable plastic/solid management programme(s) was enquired into.

Willingness to Participate in Sustainable Management of Solid/Plastic Waste

This section sought to know if respondents will be willing to participate in government proffered solutions to plastic waste problems. Questions in this aspect bordered on whether people will be interested in taking part in programmes such as recycling of plastic; whose responsibility is it to ensure achievement of sustainable plastic waste management in the State. The State Government is planning to place a ban on single – use plastic, how willing are the respondents to comply when it is pronounced for implementation. Some State Government – owned Ministries and parastatals have already banned the use of such plastics in their premises as shown in Figure 3.4.

Figure 3.4

Lagos State MOE & WR campaign against Single – use Plastic



Note. Self– taken photograph

In one of her attempts to encourage plastic waste recycling, Lagos Waste Management Authority (LAWMA) in 2021 launched the Lagos Recycle Initiative (LRI) in Lagos State. They used the opportunity to introduce PAKAM plastic recycling App for households in Lagos to make plastic waste recycling much easier and interesting to the populace (UNIDO, 2021). In this vein, the popularity of the PAKAM recycling App waste was tested among the respondents.

Other enquiries have to do with payment for waste carting services and whether there is need for households to pay for waste services charges or not and how the household currently dispose of their municipal solid waste.

Study Procedures and Ethical Assurances

It is worthy to mention beforehand that all stipulated procedures were followed and approval from Unicaf University Research Ethics Committee (UREC) was sought and granted for the commencement of data collection for the study. Before the UREC approval was granted, details of the study procedures were provided and ethical assurances were spelled - out in the Unicaf University Research Ethics Application Form, Doctoral Studies. Though, there was no foreseen potential risk nor possible psychological harm that is associated with the study that

may differ from the usual risks that may be encountered in everyday normal activities of individuals, but since it involved interaction with humans, certain measures must be put in place during data capturing. To fully discuss these measures, it is necessary to look briefly at the study procedures.

Study Procedures

The study critically investigated the contemporary social phenomenon of the unsustainable plastic waste management to gather information that could be used to initiate actions towards achieving globally acceptable levels of sustainable solid/plastic waste management by households in Lagos. The study will help to decipher how best the households could be incorporated into the sustainable plastic waste management programme to play certain sustainability roles that could aid the transitioning process to sustainable plastic waste management in Lagos. Using the Circular Economy concept as a guide, the generated information could be used for ‘evidence – based policy formulation in an effort to bring to an end, the menaces caused by the extant plastic waste management practice while enhancing economic growth.

The study followed the mixed methods research approach while the study design is mixed explanatory sequential design. This research design entails the carrying out of two data collection and analyses strands; the initial strand was carried out quantitatively through survey and analysed accordingly using IBM – SPSS software and Microsoft excel software. The second phase involved the use of results from the quantitative phase in a qualitative pattern to compliment initial strands’ findings. In the quantitative strand, survey was conducted using closed – structured questionnaire. The delivery method for survey was hand – delivery while the respondents read through on their own to answer questions from the options supplied by the researcher. Descriptive information was gathered in the process for descriptive analyses using Microsoft excel sheet. Non – probability sampling technique was deployed and only

respondents willing to participate in filling out the questionnaire were used. For the questionnaire administration, the convenience sampling approach was used to gather data from the respondents who must be a resident of the area from which data has been drawn. The potential respondents were approached in their living environment and excused for a brief discussion on the study and once they agreed to participate, they were handed the questionnaires to self – administer and the consent form to fill and sign. The process is continued in the same locality as stratified until the targeted sample number was reached. In some very few situations, some respondents asked to clarify some matters.

Ethical Assurances

The targeted respondents were those whose ages ranged from 18 – 70 years and the sampling was carried only with available and willing respondents within the community as at the time of sampling. This means that there would not be need to get guardian forms signed as everyone within this age bracket is believed to have the mind of their own. The purpose of the study was clearly summarized at the beginning of the questionnaire and potential respondents were assured that their responses will not be identified with them in any way as responses; they will be made anonymous by all means possible. Also stated in the questionnaire is the fact that it was not compulsory for an accosted respondent to participate in the survey and more so, they were informed that at any point in time they may decide to opt out without being queried or punished for doing so. Evidently, the questionnaire never had a space where the respondents were asked to write their house address, phone number, among others that may be too personal.

Data Collection and Analysis

Two strands of data were collected as is usual with mixed methods sequential explanatory research design. The initial quantitative phase became necessary to draw information on the opinion of the sampled population on sustainable solid/plastic waste management among others in the state of Lagos. The section is a minute portion of the study

as previous studies in Lagos have shown trends in findings in this aspect of the populace opinions, behaviours, attitudes towards waste management improvement and willingness to participate across the broad socio – economic classification (fully discussed in section 3.5.1) in Lagos. This minute quantitative portion of the study was used as a guide towards the qualitative phase of the study where the majority of the answers to the research questions will be retrieved and used when the need to implement a developed policy that may arise as a result of this study and other similar study findings. Data collection for the study was triangulated and data analysis treated likewise while the findings were integrated on analysis of the qualitative phase. Though the quantitative strand of the study might be considered a minute portion of the study as similar studies have been carried out using probability sampling in a survey with structured questionnaires, the study at hand used non – probability sampling to see whether the claimed trends of socio – economic status affecting one’s decision and attitudes on sanitation matters still remained in Lagos. To understand the quantitative section, it is necessary to give a brief on the nature of the survey questionnaire.

Nature of Survey Data Collected and Analysis Applied

In a survey, information is collected from sampled respondents from their responses to provided questions (Ponto, 2015). The survey portion used structured questions with predetermined answer options that were majorly qualitative in nature. The tool for data collection in the survey was the questionnaire and surveys are very useful in non – experimental descriptive designs where it is intended to describe reality; often use for the collection of behaviours and attitudes. A cross – sectional survey was employed to capture a snapshot of respondents towards sustainable solid waste management based on the existing socio – economic strata (Mathers et al., 2007). Opportunistic or convenience sampling of respondents was adopted, though this is often frowned at in quantitative social research. However, a survey could be quantitative or qualitative in nature (Ponto, 2015). The involvement of the structured

questions in the questionnaire with predetermined answers made the survey section to be classed as a quantitative survey. However, the data captured are majorly descriptive in nature than numeric that is associated purely with quantitative researches.

The questionnaire included demographic questions as well as other relevant research sections bordering generally on solid and plastic waste management and the attitudes towards it. Categorical data was collected from closed – response questions that have unordered answer options. The data type collected fall within the following categories which has to do with demographic characteristics that is more about who the people are (attributes); opinions of the people that relates to what they considered might be true; what they know or accept to be true (belief); what they really do (behaviour); what they present as being wanted (attitudes); and preferences – what they would choose where choices exist (Polland, 2005).

The fundamental aim of quantitative survey studies is geared towards the description of numeric distribution of variables within the study population. For example, when the prevalence rates of an issue are being considered. In this regard, it is paramount that there exists a statistical representative of the sample, assurance of precision of estimates. But with qualitative inclined survey types, the variation among a population can be established without necessarily counting the respondents with similar characteristics but the diversity of the variation in term of relevant dimensions and values. For a given population, qualitative survey examines the diversity of the topic(s) concerned (Jansen, 2010).

Jansen (2010) stated that the quantitative or qualitative nature of data is established during the analysis. Before the data was gathered, the areas were stratified into Low – Income (LI), Middle – Income (MI), and High – Income (HI) areas/wards. Every respondent from such Low – Income areas were coded LI. This means that there is LI – West, LI – East and LI – Central Districts with similar colour code for ease of analyses and references. The same was done for Middle – Income (MI) and High – Income (HI) for the three Districts. The paper – gathered

data was analysed using the IBM – SPSS and the Microsoft Excel software after coding the responses (transcript) of the respondents. The descriptive data from the structured questions of the questionnaire was now converted to numeric data to get the diversities of variations with respect to different questions and the variations across the different socio – economic strata. The graphic representations in pie and bar charts among others were then developed in order to give a clearer meaning to the gathered data.

Qualitative Data Collection and Analysis

The second strand of data collection was done through face – to – face interviews which involved one – on – one interviews as well as Focus Group Discussions (Catane, 2022). The instruments used for capturing data are semi – structured and unstructured interview manuals. The interview manuals were designed to extract from respondents the information that will answer the majority of the research questions in order to achieve the purposes of the study. Purely descriptive data were retrieved in this section of the study.

Purposive sampling which is a type of non – probability sampling approach (Pace, 2021) was carried out for the section of the data collection. Purposive sampling is usually applied when the knowledge of the studied topic is high and there exists the knowledge of potential respondents that could be taken to have vast knowledge in the area of study or are considered to be experts in that field (Ames et al., 2019). Purposive sampling is used to identify and select presumed information – rich potential participants in accordance to the social phenomenon of interest in qualitative inclined study (Palinkas et al., 2013). Three major types of interviewees can be broadly identified in this case based on the information that is needed. For instance, the study wants to know how the authorities responsible for solid/plastic waste management have handled it that led to the state of its present mismanagement level. In this case, Lagos Waste Management Authority (LAWMA) is the State’s Government arm that is solely responsible for solid waste management in Lagos (MOE & WR, 2022). In this regard,

respondents who have put in several years with a lot of experience working in LAWMA were drawn to the study knowing their potential knowledge in this field. Questions like, how have solid waste management/regulatory bodies made effort to sustainably manage plastic waste in Lagos and why have they not achieved tangible results were asked of this group?

However, LAWMA is a parastatal under the supervision of Lagos State Ministry of the Environment and Water Resources (MOE & WR) that is responsible for the formulation of policies on matters related to solid waste management in the State. This second category of respondents because of their schedules of duty are presumed to be knowledgeable in the solid waste management policy formulation in the State. Among others, this group was expected to furnish the study with information on existing policies on plastic waste management, in the past, at the moment and what the future plans may be, if it does exist. More so, the research question relating to what extent the roles of the households were considered in the present arrangement was enquired from the group. Some among this group were responsible for plastic waste management initiatives in the past and even currently in the ongoing reformation in that sector. Thus, answers to how the households can be integrated in the value chain of solid waste management to play some sustainability management roles that could aid the transitioning to sustainable plastic waste management in the study area was demanded from them.

The third category of participants were the plastic waste recovery groups at the dumpsites in Olusosun, Ojota and Sulos, Igando. Classed in this group is the plastic aggregators/merchants and the recovered plastic waste off – takers. How the plastic recyclers are organized and what challenges have hindered the ultimate plastic waste recycling in Lagos, Nigeria could be retrieved from them.

Focus Group Discussions were held at different places and times with the FGD team from MOE & WR, LAWMA and the plastic waste recovery groups from the aforementioned two dumpsites (See Table 3.2 for the breakdown of the groups). One – on – one direct interview

was held with senior officials of three plastic recycling companies in Lagos. After the FGDs with officials of MOE & WR, requests were made to have one – on – one discussion with a few as a result of some likely sensitive areas that some seemed not ready to discuss in the group to avoid being quoted by their colleagues in wrong places.

The interview as a part of the research data collection tool was discussed extensively in section 3.4.2, while participants selection for the interview was previously elaborated upon in section 3.3.2 in the interview sampling.

Thematic Analysis of Qualitative Data

Thematic analysis is a technique that is used to examine information in data sets of studies that are classed as qualitative descriptive design and is used for textual data analysis to identify themes which in turn could lead to a possible description of the social phenomenon of interest. It intently examines the data set for common ideas, topics, concepts, patterns of meaning among others (Vaismoradi et al., 2016). Thematic analysis is described as the study of patterns carried out in order to bring out the meanings of collected data. In thematic analysis, themes are analysed within the data set so as to identify the meaning inherent in the data set with the research questions as the driver of the process. It is worthy to mention that, being a subjective process driven by the research questions, not all inherent themes in the data set must be identified. The themes meant to be identified or focused on are the ones related to the research questions before others may be identified as emerging information (Crosley, 2021).

The process involves the use of codes for the identification and summarization of crucial concepts of the data set, like the interview transcript. The process of assigning a label to some text is known as coding. The data is here categorized in such a way that themes and patterns could be derived from the data. Codes are fundamental units for themes while a theme is a pattern of reasoning identifiable from the data set. The patterns are sometimes concepts or topics that are often mentioned repeatedly in the data. To answer research questions in thematic

analysis, codes are usually grouped into themes that are used to summarize certain sections of the data set (Crosley, 2021). Thematic analysis is a useful tool when it is necessary to get details of respondents' views, knowledge, opinions, among others from a qualitative data set. There are four major approaches to carry out thematic analyses which depends on steps taken (Crosley, 2021; Adewusi, 2020).

The four majorly identified approaches in thematic analysis are latent, semantic, inductive, and deductive approaches (Crosley, 2021; Adewusi, 2020). Though it is possible to use the combination of thematic analysis approaches in a single study or data analysis, but of these approaches, an inclination towards deductive thematic analysis approach was adopted for the analysis of the qualitative data from the interviews. In this approach, the researcher is well informed of the subject and is aware of where the research is heading to as a result of his/her knowledge on the matter or the theory/conceptual framework (Crosley, 2021; Adewusi, 2020). The bottom – up approach to data coding and analysis is referred to as the inductive approach. This approach is data – driven; which implies that the codes as well as the themes are derived basically from the data content and what is therefore made out during the analysis by the researcher is a match or near match to the data content. Whereas with the deductive approach which is a top – down approach, entailed that some ideas, concepts, are brought by the researcher to the series of data in order to interpret them for their meanings. The codes, themes and patterns are drawn more from ideas, concepts, theoretical frameworks that is brought in to the data by the researcher (Braun & Clarke, 2012).

Thematic analysis is a way of analyzing qualitative data that gives room for flexibility and can be used within different types of paradigms. It comes handy when and where one intends grasping the thoughts, experiences or behaviours across a given set of data. It involves looking for pattern or meanings in a data set that can give clue or directly answer the research questions. The themes are often generated either inductively or deductively (Kiger & Varpio,

2020). But Braun and Clarke (2012) asserted that in reality, thematic analysis usually involve the combination of both, since it is almost practically impossible to be completely inductive as researchers will always bring some knowledge into the data analysis.

There are three types of thematic analysis basically and these are, coding reliability, codebook and reflexive thematic analyses. Crosley (2021) stated that whereas codebook and reliability thematic analyses necessitates code development before and at the start of the analysis, the reflexive thematic analysis type usually postulate codes at the later stages or tail end of the analysis: a process that is distinctive with inductive coding. The code reliability thematic analysis is the type usually involving the use of multiple coders and typically designed for research teams who must work with specifically fixed codebooks that are rarely altered except for some serious cogent reasons like where codes are found not to be matching data sets. However, codebook thematic analysis implores predetermined codes and codebooks and often undertaken from the deductive perspective. The codes are mostly derived from the review of data. Being deductive in nature, the terminologies inherent with theoretical and conceptual frameworks become useful in drawing out or creation of a codebook (Crosley, 2021).

The generic steps to thematic analysis taken for data analysis are:

Familiarization with the Data: At this stage, data transcripts were read severally to get use to its content. Where audio recordings were permitted, the recorded information was listened to severally and necessary, basic points were transcribed and written out/converted to text as the situation necessitated. The part concerned trying to decipher the codes, the types of codes to use and the ones that will best describe the data set contents. Coding here entailed the transcriptions of phrases or sentences into short labels. In doing this, the topic of the research work, the aims and objectives served as the basis of coding.

Search for Themes or Patterns in the Codes: This stage involved the identification of themes or pattern from the codes. Sometimes, between the codes and themes, subthemes were

identified as one becomes more acquainted with the data. The created codes were critically examined to see existing patterns which were used to develop different themes which are more or less superset of the codes generated on the basis of the topic, research aims and objectives.

Themes Review: As the step's name implied, the generated themes were critically re – examined to ensure that all that were categorized as themes have a connection with the data and are actually fitted in. Checks were made here to determine whether there were themes left out or some of the generated themes do not actually belong to the data. The comprehensiveness of the themes gave an understanding for the movement to the next stage which involved a look at the research questions to determine whether the generated themes were germane to the research questions.

Finalization of Themes: At this stage, the themes were described in details, specifying what the theme exactly stood for or consist of as the emphasis were on ensuring that themes were in alignment with the research questions.

Production of Report: This is the report writing stage to showcase one findings and conclusions.

Summary

The extant solid waste management in Lagos is far below the globally acceptable practice. It is unsustainable and has serious adverse effects on the environment, the economy and the society in general (Bello et al., 2016; Oteng – Ababio et al., 2013). This practice portends danger and the need to proffer workable solutions to the problem is germane (Maiyaki et al., 2020; Abila & Kantola, 2013). The most prominent of the waste fraction is the plastic fraction that seemed to be ubiquitous, constituting nuisances in and around the metropolis. Plastic waste mismanagement is basically as a result of existing human and socio – cultural structure in the study area. All efforts put in place to curb the plastic nuisances have failed to yield tangible results. Fingered as some of the reasons for the failures are, the non – inclusion of households

in solid waste management plans and mechanical – based approach rather than human – based approach applied (Ojelola et al., 2020; Ojewale, 2019).

The study reasoned that households being the first handlers/highest generators of municipal solid/plastic waste, their roles should be fully considered and be integrated in the waste management plan/system to curtail waste leakages from in – house management amongst others. Hence, the purpose of this mixed methods research (Almalki, 2016; Doyle et al., 2009) was to investigate into how the households have contributed to the extant unsustainable plastic waste management and therefore through the findings contribute towards deciphering how they could be integrated into the sustainable plastic waste management system to minimize plastic waste leakages toward achieving sustainable plastic waste management in Lagos, Nigeria. The guiding frameworks are the Transition Management Theory (Loorbach, 2010) and the concept of the Circular Economy (Mrowiec, 2018; Valavanidis, 2018; Preston et al., 2019).

Before the commencement of data collection, approval from Unicaf University Research Ethics Committee (UREC) was sought and approval granted having provided all stipulated ethical assurances and followed the set procedures.

A ‘case study research design’ that is often contextual and the sequential explanatory mixed methods design (Wariri et al., 2020) that permits the triangulation of data collection and data analysis were adopted for the study (Brink, 1993). Two strands of data were collected and analyzed sequentially. Initial phase applied non – probability sampling technique in a cross – sectional survey (Ponto, 2015) with structured, hand – delivered questionnaire as a data collection tool and descriptive statistics was used to analyze the data sets (Viljoen et al., 2021). The data was collected from three stratifications arising from the socio – economic dwelling statuses (Mathers et al., 2007) visible across the metropolis (which are, Low – Income (LI), Middle – Income (MI), and High – Income (HI) areas). In the second strand, qualitative data was collected to complement and further treat the findings of the initial strand through

interviewing (Alshenqeeti, 2014) that applied purposive sampling of participants (Ames, 2019), using semi – structured and unstructured interview manuals as data collection instrument. Thematic analysis of the qualitative data intently examined the data set for common ideas, topics, concepts, patterns of meaning among others to ensure that the research questions were appropriately answered (Crosley, 2021; Adewusi, 2020; Vaismoradi et al., 2016).

CHAPTER 4: RESEARCH RESULTS

Introduction

The data gathered from the survey was analyzed using IBM – SPSS and Microsoft Excel to give room for the measurement of the findings on the overall study population. In this case with a descriptive design, descriptive statistics (mode, mean, median, standard deviation) was employed to measure the spread of the data within the study population (cf. Hoe & Hoare, 2012). Four major variables (i.e., the demographic and socio – economic characteristic of respondents, the knowledge of solid waste/generation/management, perceptions and attitudes towards sustainable plastic waste management, and the willingness to participate in sustainable management of solid/plastic waste) were sought and 40 questions as sub – variables were asked and the data retrieved was analyzed. Thus, the meanings were made of the collected quantitative data (Section 3.7.1). For the qualitative data, Word Cloud software generation of codes from where themes and concepts were drawn from in a thematic fashioned analysis was deployed (Figure 4.43) to give meaning to the collected qualitative information (Section 3.7.2).

After the brief recap to the data analysis, a look into the trustworthiness (Section 4.1) of the collected data was discussed with an emphasis on the credibility of collected data, transferability – clear and simple explanations on how data was captured, dependability of applied methodology that could allow study repetition, and confirmability – stating study assumptions, identified research shortcomings, amongst others. Section 4.2 dealt with data reliability and validity, where the consistency of the entire research study was addressed as a means of measuring reliability and both internal and external validity of the study were critically examined. The section (4.3) afterward looked at the findings from the gathered data with graphical illustrations. Having applied mixed explanatory sequential research design, where the qualitative strand was used to facilitate results of the initial quantitative findings; findings from the survey questions were first presented and followed with the findings from the qualitative strand. Section (4.4) was centred on the evaluation of findings, whether the result

in brief conformed to the theoretical frameworks or its tenets. Finally, the summary of the entire Chapter 4, brings forth the salient points in section 4.5.

Trustworthiness of Data

One of the main purposes of data collection in a research process is to generate information which could be used as a premise for making vital decisions. Hence, it is necessary that the data that informed the decision making must be trustworthy, otherwise, wrong decisions will be made from unworthy data (Shenton, 2004). To make good and acceptable decisions in evidence – based practice, it is pertinent that the data used is trustworthy. It is asserted that the trustworthiness of particular data can only be as better as the tools and methodologies applied in the collection of the data (Eldridge, 2020).

Abowitz & Toole, (2010) pointed out that the application of research methods that is inappropriate for specific researches has dire consequences as they may end up generating misleading results. They also mentioned questionnaires, focus group discussions, surveys, and, ethnographic observations, as useful research tools, but that the degree to which they can be used to generate meaningful results with a specific research question differs as the possibility of yielding different views with respect to the research question does exist. Hence, each research tool faces to a certain extent, the issue of reliability and validity; which also makes them different when it comes to their use in the generalization of findings. It is therefore necessary that researchers must take into cognisance the possible implications of their chosen methodology.

For data to be collected successfully, there is need for thorough research planning and selection of appropriate research designs. In drawing out a research design, certain decisions have to be made with respect to the topic that one intends to study; who the targeted study populations are, which research methods will be appropriate, what the main purpose of the study and possible outcome(s) is/are anticipated (Abowitz & Toole, 2010). Along this line, the

subjects to be included in the study must be properly spelt out, sampling techniques as well as the sample size marked – out, best possible data collection method identified for application to bring out answers to the research questions (Kumar, 2011; Abowitz & Toole, 2010).

The research questions that are feasible, relevant, well – defined, and manageable have influence in almost all the steps that will be needed in order to carry out the study properly and could be said to be the keystone to determine whether a study will end up well with the generation of information that could be used for proffering the right solutions to complex societal problems (Ratan et al., 2019). The first research question for the study at hand sought to gather information on the opinions, attitudes, beliefs, culture of households in the study population on the extant solid waste management and the need for sustainability transitioning. This necessitated the use of structured questionnaires in a one – shot survey since it can easily be used to attend to a wide subject of a high number of respondents in a short period of time and the results can be extrapolated. The structured questionnaire research method is categorized as part of the quantitative research method in line with the positivist paradigm (MBA Skool Team, 2022). The study carried out two strands of data collection; the first phase being quantitative in nature through hand – delivered, self – administered survey with structured questionnaires. The second phase is comprised of the qualitative data collection through face – to – face individual interviews and Focus Group Discussions using semi-structured and unstructured interview manuals. The combination of quantitative and qualitative methodologies of data collection in a single research study is referred to as the triangulation of data collection, which is geared toward securing more credibility and the general trustworthiness of the collected data (Lemon & Hayes, 2020; Solano, 2020).

The positivist paradigm researchers have questioned the trustworthiness of general qualitative research studies on the ground of lack of rigor in their process which they claimed leads to doubt in their validity and reliability (Grodal et al., 2021; Kumar, 2011; Bashir, 2008;

Golafshani, 2003). However, qualitative research methodology has come to stay as its acceptance as means of generating information through research has gained tremendous acceptance across the globe (Grodal et al., 2021). Several authors have written on measures that could be incorporated in the qualitative research processes that could handle issues as related to validity and reliability in a quantitative research paradigm (Kumar, 2011; Shenton, 2004). Positivism is objectivity – minded while post positivism focuses on subjectivity in addition and interpretivism is subjectivity – minded (Dawadi, 2021). In a way of distancing themselves from the positivist paradigm ideologies, the naturalist developed different terminologies for qualitative research that correspond to the criteria for the evaluation of quantitative research as shown in Table 4.1, adopted from Kumar (2011).

Table 4.1

Traditional Criteria for Judging Quantitative Research and the Developed Corresponding Alternatives means for Evaluating Qualitative Research

No	Conventional	Mean	of	Evaluating	Corresponding	Criteria	Developed for
	Quantitative Research				Evaluating Qualitative Research		
1	Internal Validity				Credibility		
2	External Validity				Transferability		
3	Reliability				Dependability		
4	Objectivity				Confirmability		

Note. Adapted from *Research methodology: A step – by – step guide for beginners*, Kumar, 2011, p. 185.

There are several ways to enhance the trustworthiness of the data collection phase of a research study. Shenton (2004) surmised that there are four major criteria for a naturalistic investigator through which researchers make effort to satisfy, in order to address issues concerning securing the trustworthiness of data in research/studies. These were presented as

credibility, transferability, dependability, and confirmability (Kumar, 2011). A critical look into aforementioned area shows that:

Credibility

Credibility centres on every effort that researchers placed to the research process in order to ensure the research investigation actually captures the phenomenon of interest (Shenton, 2004). From the mindset of a positivist researcher, this section is viewed from the angle of internal validity. In the naturalist mindset, it attempts to ask the question of how close the result is from the extant reality and credibility is claimed to be one of the major means of affirming trustworthiness of the data collected (Nowell et al., 2017; Shenton, 2004). For the naturalistic researcher to achieve notable trustworthiness for a research project, he or she will need to show that the instrument used in capturing specific data reflects the nature of data to be captured, which must be carried out extensively until the saturation point is reached. Furthermore, it should show that the applied recording system is apt and demonstrates that the method applied for data analysis and data interpretation are well detailed to the point that the targeted readers will be convinced that credible process was undertaken to generate the findings. Trustworthiness is a way of self – persuasion of the researcher that rigor has been put into his/her study to the extent that it is worth drawing the attention of the readers (Nowell et al., 2017).

Several techniques have been suggested that should be followed that may enhance credibility of a research process, such as extensive and probing engagement, triangulation of data collection, continuous, reflexive iterative observation, and, process operationalization (Nowell et al., 2017). Also, among the suggested techniques, the following were considered in the current study:

Ensuring the Selection of Appropriate Research Methodology

In the selection of methods that suit the type of research, it was ensured that the methods picked are those that had been established and are acceptable as a means of investigation by various research paradigms. However, the concept to be studied was correctly operationalized to enable accurate or near accurate measurement of the concept by ensuring that the abstract concepts are turned into objective observations that could be measured as observed in other comparable studies successfully implemented elsewhere (cf. Nowell et al., 2017; Shenton, 2004). Previously set – out procedures were applied in the set – up of questions for data collection as well as in data analysis. For the quantitative phase of the study, the questionnaire was categorized into sections using similar variables of demography and socio – economic characteristics of respondents, their general knowledge of waste management, perceptions and attitudes towards solid/plastic waste management, and the willingness to participate in sustainable management of solid/plastic waste within the study area. The variables utilized are in tandem with studies along the same axis of waste management as recommended in some literature (Nowell et al., 2017; Abowitz & Toole, 2010; Shenton, 2004). As indicated, Abowitz and Toole (2010) social sciences’ studies, do not have a one method fits it all approach. The qualitative phase of the study applied the semi – structured and unstructured interview manuals as instruments for the collection of qualitative data as were done in previous studies elsewhere (Shenton, 2004).

Developing Prior Acquaintance on the Organizational Culture of the targeted Institution before the Commencement of Data Collection

Shenton (2004) suggested that familiarization with the culture of the anticipated organization could be established through the review of related documents, visitation to organizations in advance, and creating personal links with gatekeepers of the organization. By doing so, some lines of rapport would have been created between the researcher and the

participants that would also allow for the establishment of trust for a smooth flow of discussions without necessarily holding back. Erlandson et al. (1993) referred to this type of familiarity building as prolonged engagement with participants and observations show that it will bring out the best from the participants. Being an officer at the ministry responsible for environmental protection in the study area, this has presented some advantages in order to leverage and capitalize in having a prolonged engagement process with several organizations in the value chain of waste management, environmental protection, and the organization of the informal waste sector in Lagos.

Triangulation in general

Another way through which the study made effort to enhance credibility was through the triangulation or use of different research methods – mixed research methodology. The data collection for the qualitative strand of the study used individual face – to – face interviews as well as Focus Group Discussions (FGDs). Shenton (2004) argued that since FGDs and individual interviews are variants of an interview, the possibility that the two will have near – similar shortcoming(s) exists but, that notwithstanding, it does not cancel the fact that their individual characteristics or distinct nature does lead to the individual strength combined. The individual strength of the different methods brings about the compensation of their individual weaknesses as the individual benefits are harnessed. For the quantitative phase, extensive literature review was carried out to get background information on the attitudes, beliefs, behaviours, and practices of households in Lagos towards the extant solid waste management in the study area and their willingness to participate in the pursuit of sustainability. Some studies have shown some common trends across the socio – economic strata of dwellings. The study followed the common stratification of the study area into High – Income, Middle – Income and Low – Income dwelling areas which is very pronounced in Lagos.

According to Shenton (2004), one way of doing triangulation is to engage wide participants with different backgrounds but along the value chain of the phenomenon under study. A process referred to as triangulation through data sources (Cope, 2014; Heale & Forbes, 2013). In this aspect, the study sourced information from variant interviewees as shown on Table 4.2. The informants were drawn from officials of the State Government who are responsible for policy formulation towards general environmental management and those on whose purview lies with the management of solid waste. Other informants were drawn from plastic waste scavengers and recovered plastic waste merchants from three different dumpsites. The remaining informants were drawn from plastic recycling companies that are the final off-takers of recovered plastic wastes. Hence information was drawn from plastic waste scavengers, aggregators, end – users, the policy formulators, and the waste management regulators. This action was meant to further strengthen the credibility of the findings of the study (cf. Shenton, 2004).

Site triangulation was also carried out in the study. For example, the plastic scavengers and the plastic merchants' interviews were carried – out at Olusosun Dumpsite, Ojota, Ikeja Local Government Area (LGA) and the Solus dumpsite, Igando, Alimosho LGA. In the same vein, 3 different plastic recycling company officials were interviewed at different locations as was done with the State Government Official of LAWMA and MOE & WR. In similar situations, the emergence of similar results from different sites on specific matters adds more credibility to the research as it helps in giving a more stable and balanced view of the reality (Shenton, 2004; Dervin, 1983), focusing on ensuring the following in the process.

Winning the Participants from the Onset

In this section, it is necessary that would – be informants are approached in a manner that they are convinced to willingly participate in the project which will enable the participant to freely and honestly give out the needed information. The participants should from the onset

be informed of the fact that it is not compulsory to participate and that they have the right to pull – out of the discussion without necessarily being asked why (Shenton, 2004). Therefore, the consent form with a research purpose and the declaration of the rights of participants

Table 4.2

Variants of Interview and number of Participants

No	Activity	Number of Participants
1	FGD with MOE & WR Officials	8 Person – FGD
2	Individual Interview of MOE & WR Officials	7 Individuals
3	FGD with LAWMA Officials	5 Person – FGD
4	Individual Interview of LAWMA Officials	5 Individuals
5	Individual Interview with Plastic Waste Recycling Companies	5 Individual from 3 different Companies
6	FGD held with Recovered Plastic Waste Merchants at Olusosun Dumpsite, Ikeja	7 Person – FGD
7	FGD held with Recovered Plastic Waste Merchants at Solus Dumpsite, Igando	8 Person – FGD
8	Individual Interviews with Plastic Waste Scavengers at Solus Dumpsite, Igando	7 Individuals
9	Individual Interviews with Plastic Waste Scavengers at Olusosun Dumpsite, Ikeja	10 Individuals
	3 FGDs	28 Participants
	4 Variants of Individual Interviews	34 Participants
Total No. Interview		62 Participants

becomes an essential tool for the exercise (Manandhar & Joshi, 2020; Roache, 2014). Convenience sampling has been established as a standard of data gathering within the developmental sciences while probability sampling has also been identified as not too well – suited for the investigation of developmental questions (Jager et al., 2017).

Deploying Probing and Iterative Questioning Tactics

The major advantage of face – to – face(s) interaction, whether individual interview or Focus Group Discussions is the provision of an enabling environment where spoken and unspoken points could be better understood by digging deeper through the use of iterative and probing strategies. Rephrasing of questions can be used to bring out details concerning the emerging information or that which seems partly covered by participants.

Creating Avenue for Continuous Debriefing

The feedback mechanism as has been established by the school authority (UNICAF University) in the submission of assignments and the giving of feedbacks indeed was tremendous in contributing to frequent debriefing with the supervisor from one section to another. It helps to widen the vision of the research and bring about good ideas and concepts that were not thought of beforehand. It could sharpen the attention of the researcher to see areas where personal biases have set – in for amendment purposes, thus enhancing credibility (Shenton, 2004).

Peer Reviewing of Research Work

Though similar to section (iii), but this section gives room for other researchers apart from the immediate supervisor to review the research work so far and provide feedback that may include suggestions on what they think needed to be included or excluded (Shenton, 2004). One of such avenues was the presentations made at UNICAF Graduate Conferences, which gave room for a high level of audience that made remarks on areas of improvement and concerns which were duly noted and adjusted accordingly where necessary.

Detailed Description of the Study Phenomenon

Efforts were made to ensure that the phenomenon under study was fully described to the point that a seeming picture of the extant situation could be easily drawn out by the readers. According to Shenton (2004), giving a detailed description of the study phenomenon helps to promote research credulity.

Examining the Congruency of Findings with Previous Research.

In this respect, the findings from the study are juxtaposed with other related previous studies to see how congruent the findings are with previous studies conducted elsewhere. The ability to show that findings show similar trends with previous studies is a way of measuring trustworthiness of a qualitative investigation (Shenton, 2004).

Transferability

This is related to the degree to which the results of the study or investigation from the study area could be applied to other areas or situations (Shenton, 2004). Transferability was simply put as the generalization of the findings of a study (Nowell et al., 2017). With the positivist's ideology, it is about how findings from a specific research work could be applied to a larger population. But with the naturalist, most works or studies are focused on a small portion of the wider population, for that reason, it is much difficult to show that the arising results could be applied to other phenomenon or population (Dawadi et al., 2021; Nowell, et al., 2017; Shenton, 2004).

One of the ways to ensure the enhancement of transferability is for the investigator to provide detailed step – by – step description of the processes taken to arrive at the findings, so that whoever needs to transfer the research finding(s) to their own site will be able to decipher or judge on their own the transferability of the findings with respect to their site (Nowell et al., 2017).

However, the study at hand applied both quantitative and qualitative research methodologies in order to be able to answer some research questions more satisfactorily. The integration of qualitative and quantitative research methodologies in a single research work brings to the fore the mixed methods research that combines post – positivism and interpretivism frameworks to complement each other (Dawadi et al., 2021).

It is argued by some authors that as long as observations are context specific in most naturalistic studies, the issue of generalizability might never be possible (Smith, 2018; Shenton, 2004). However, some authors are of the opinion that where the situations described are similar to what the new researcher has or in their understanding, then the basis of relating findings to theirs can arise. Thus, the emphasis is that the researcher should take the responsibility of giving adequate and clear contextual information concerning the fieldwork, to enable the reader to determine whether the findings are transferable (Shenton, 2004).

Dependability

In order to achieve some level of dependability, it is pertinent to present the research processes in a logical, well – documented and traceable manner (Nowell et al., 2017). For the positivist research paradigm, dependability is about the reliability of techniques followed to achieve the findings. It centres on the belief that the same technique can be applied or repeated another time by someone else, the same participants and or similar environments to achieve the same result (Shenton, 2004). But this may prove problematic with a naturalistic researcher as a result of the changing nature of the phenomenon understudied at a particular time and place (Shenton et al., 2004).

Shenton et al. 2004 (p.71) mentioned Lincoln and Guba (1985) to have stressed that there are strong ties between dependability and credibility to the point that attempts made to enhance one of the two goes a long way to enhance the other unintentionally. In order to achieve a better reliability in the naturalistic research process, it is emphasized that the phenomenon

under study should be well detailed for the reader to get an easy grasp of the situation and the research processes. Dependability can be improved upon with the use of overlapping methods like conducting Focus Group Discussions and individual interviews as sources of information (Shenton et al., 2004). The detailed description of the phenomenon under study should be clear:

Full description of the research design and its processes of implementation entailing what was planned and the implementation strategies from level – to – level.

Details of the fieldwork and how data was captured.

Reflective evaluation of the processes applied to come out with the findings and conclusions drawn (Shenton et al., 2004).

Confirmability

It is about the demonstration that what the researcher gathered from the data or interpreted the data to mean are actually from the data and hence the findings truly originated from the gathered data. It entails that the researcher systematically demonstrates how the conclusions and the interpretations were drawn (Nowell et al., 2017). Confirmability is also about demonstrating that the researchers' personal bias was not used in the interpretation of the data. Triangulation is applied to ensure that the effect of the researchers' bias is reduced (Shenton et al., 2004).

Reliability and Validity of Data

Research in some cases involves the asking of question(s) from respondents. In such cases of research, it is therefore the answers provided by the respondents that the researcher or investigator will base his/her findings and the conclusions that will be drawn. Hence, the questions are part of the input that when answered leads to the development of outcomes and conclusions. Before getting the data in order to conclude, the input would have gone through different stages and steps. The steps may include the following: delineation of sampling area, sample selection, data/information gathering, data analysis, report writing, and how the

researcher goes about the processes or steps involved will go a long way to impact the quality and accuracy of the conclusion drawn. It is therefore pertinent that the researcher places efforts to ensure the generation of quality results by the application of appropriate research methodology and suitable instruments in order to find answers to the raised research questions. Generically, the idea of accuracy and rightness deployed in a research process is known as validity (Kumar, 2011). Several stages and steps are involved in a research process and at these different stages, inaccuracies and inappropriateness may set in to contribute to the findings and conclusions and may end up being inaccurate. However, in the broader sense, validity is usually viewed or discussed from two major perspectives of whether the research engaged is giving answers to the established research questions or whether in the provision of these answers, the researcher applied appropriate methods and the corresponding procedures to match (Kumar, 2011). The focus at the moment is validity and reliability of the data.

Validity

Validity is that property of a measuring instrument's ability to give accurate measurement that is a representation of the actual phenomenon under study as it can be said to have measured what it was intended to measure (Mellinger & Hanson, 2020; Kumar, 2011). It is a measure of the extent to which the investigator was able to measure what was earmarked for measurement. The underlying question in this regard is whether the applied procedures are actually measuring what it planned to measure. It is about how the measured concept reflects the real meaning of the examined phenomenon (Kumar, 2011). From the later definition of validity, it may become necessary in critical thinking to ask the question of who it is that determines that an instrument has actually measured what it was meant to measure or not and in what ways can it be demonstrated that an instrument is measuring what it is intended to measure? The answers to these questions are not farfetched; the answer to the first is, the one who conceived the research and designed the research processes, then the target audience or

the likely readers of the outcome/report and those considered to be experts in that particular field of study. The answers to the later question are of essence and could easily be answered by a shorter question. Based on the mentioned submission made (Kumar, 2011) as having the right to determine accuracy of the instrument used, on what basis are they to make their judgement? Kumar (2011) surmised that in social sciences – oriented studies, two major approaches are available to demonstrate or establish the validity of the research approach undertaken. These, he mentioned to be either logic on which premise the research tools were constructed or through statistical evidence that is generated from the gathered data using the assumed most appropriate instrument(s), (Kumar, 2011).

The establishment of validity by statistical means entails the calculation of correlation coefficients of the research questions with respect to the outcome variables (Kumar, 2011). Demonstrating validity through logic involved a critical judgement of each of the raised research questions to prove that they bear a relationship to the purposes of the study/research. Kumar (2011) stated, it could be very easy and at the same time difficult to establish the existence of links between research questions and set objectives of research through logic. He clarified that it could be easy for the investigator to see the link by him/herself but, it could also prove difficult to justify the link without the backing of the experts in that area and where statistical evidence is not convincing enough. The logical link establishment is said to be easier where questions are targeted at tangible matter such as, age, height, and, weight, than when it is measuring attitudes of a group of people towards a phenomenon, the effectiveness of an intervention, and, consumer satisfaction. However, it was also stated that in a situation where lesser tangible phenomenon/concept/matters are investigated, the researcher must endeavour to ask several sets of questions to help ensure that different aspects of the concept understudied are covered in order to demonstrate that the questions are capturing what they were supposed to capture (Kumar, 2011) as has been practiced in this study.

Three major types of validity are said to exist in quantitative research and these include the following: construct, face and content, concurrent and predictive validity (Kumar, 2011). Among these types of validity, the face and content validity stand applicable for this study.

Face and Content Validity

This type of validity is tied to the logical linking of research questions to objectives of the study as a way of establishing validity that is easy to apply as it entailed the linking of every research question to specific objectives and the means of establishing validity for an instrument in a research study is known as face validity. On the other hand, where effort is put in place to ensure that the question covers a wide range of the phenomenon intended to be measured is referred to as content validity. However, it is worthy to mention here that the logical link for validity is very subjective in nature, therefore drawing a definitive conclusion does not come easily as individuals are bound to have different opinions on the matter (Kumar, 2011).

Reliability

Reliability as it literally implies is a measure of how dependable or consistent an instrument is in measuring a given parameter at different times or in a different research set – up/follow – up but with the same research population, using the same research processes and the inherent tools/instruments. The more minimized the error between different sets of findings, the lesser the inconsistency is for an instrument, and the higher the reliability (Kumar, 2011). Though the survey in the extant study was a cross – sectional one, the questionnaires were administered across a socio – economically stratified population. Most parameters sought showed a high degree of similarities and trends with other studies carried out across similar socio – economic classification of Lagos. However, it is worthy of mentioning that in social sciences research like the one at hand, it is difficult for a research tool to have 100% accuracy, since the study instrument cannot be said to achieve 100% accuracy. However, certain measures were mentioned by Kumar (2011) that can be implemented to enhance the reliability

of the instrument used in social sciences – oriented research. The factors that can affect reliability of a specific research instrument are as follows:

The ways the wording of the questions is presented. In as much as possible, the investigator in composing the questions must try to avoid ambiguity. Questions that are not clearly formulated may lead to different interpretations by different respondents and as such different responses will be given at different times.

The mood of the respondent. The state of mind of the respondents does affect their responses which will likely affect the reliability of the instrument.

The interview physical setting. It is mentioned that where repeated interviews are needed to be carried out, a change in the physical setting of the interview place could affect the data gathered and subsequently, the reliability.

The mood of the interviewer. Just like the mood of the interviewee could affect the responses given at a particular time, so it is with the mood of the interviewer through different levels of degree of motivation and interaction presented during the interview session.

Regression effect. This occurs mostly in severally repeated interview sections where the interviewee after giving their opinion with a section may feel he/she has been either too negative or positive in the responses and may try to express themselves differently in the next session.

Survey Results

The survey section of the study was geared towards finding answers to research question one (1) that is centred on knowing the opinions, attitudes, beliefs, practices and culture of the studied society towards sustainable solid waste management in the study area and RQ1 as stated is ‘what opinions, attitudes, culture, beliefs, practices do the households have towards sustainable solid/plastic waste management in Lagos?’ A cross – sectional survey was carried – out consisting of 40 questions which were divided into four major variables and preset

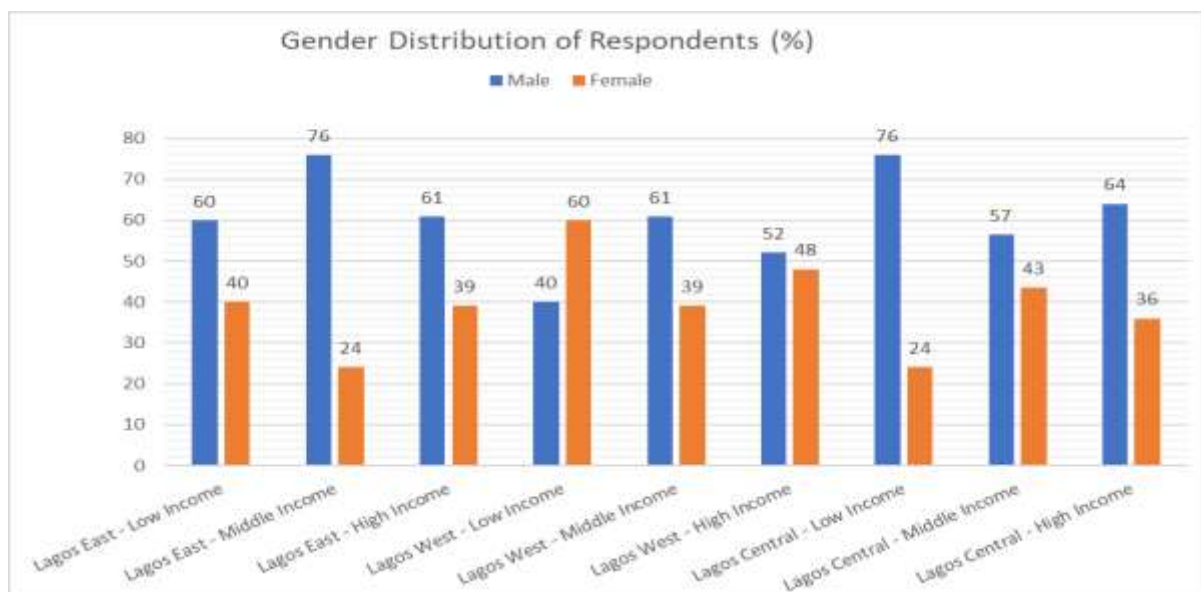
answers were provided as options as it is common with structured questionnaires following similar and previous studies to see if the identified trends in the aspects still hold. The first point of questions was on the demographics and socio – economic characteristics of the respondents, as the study stratified the study area based on the visibly existing socio – economic strata of dwelling into Low – Income, Middle – Income and High – Income dwelling areas. The findings are presented following Unicaf’s Thesis reporting format that stipulates that findings should first be presented as they are without much affirmative statement/discuss. The following observations from Microsoft Excel analysis is in the proceeding section with graphics representations of findings following the four major variables across the sought parameters in the chronological order of the questionnaire used to capture the data.

Demographic and Socio – Economic Characteristics of Respondents

Figure 4.1 shows the gender distribution of respondents from the study population. Based on the income strata, the majority of the respondents had more males (60.73%) than females (39.27%) except for the Lagos West.

Figure 4.1

Gender Distribution of Respondents



The bulk of the respondents clustered around the age ranges of between 18 – 49 years. The highest number of respondents (29.3%) were in the 30 –39 years group, closely followed by those of 40 – 49 years and 18 – 29 years (Figure 4.2).

Figure 4.2

Age Distribution of Respondents

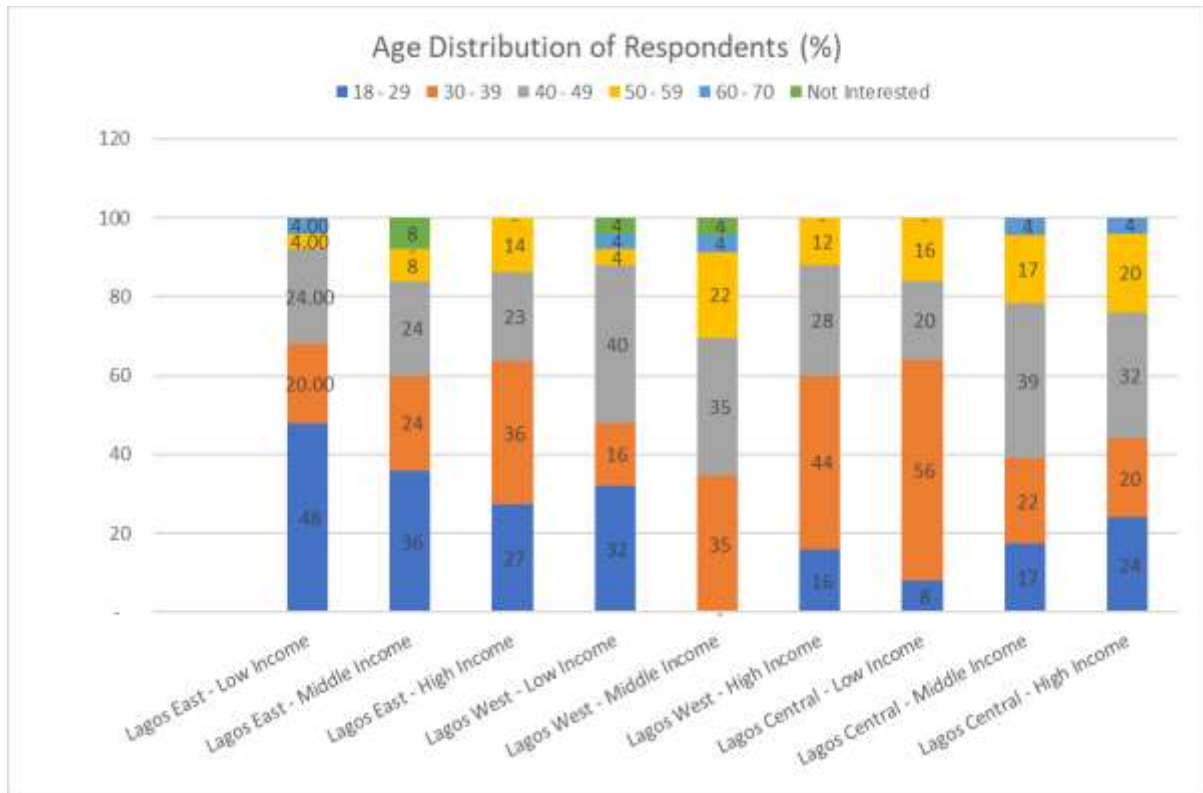


Figure 4.3 shows the percentage of respondents indicating that the majority of the respondents (59.9%) attended tertiary level of education. The second highest group of respondents (28.1%) had secondary level education as their highest level of educational attainment, followed by primary level of education. It is worthy to mention that the questionnaires were hand – delivered and self – administered and it is expected that only those who might be able to read and write in English language will volunteer to participate in the survey. Combining the secondary and tertiary educational level attainment, the result showed that the respondents from HI have more educational level attainment than those of MI and those of MI have more than those of LI.

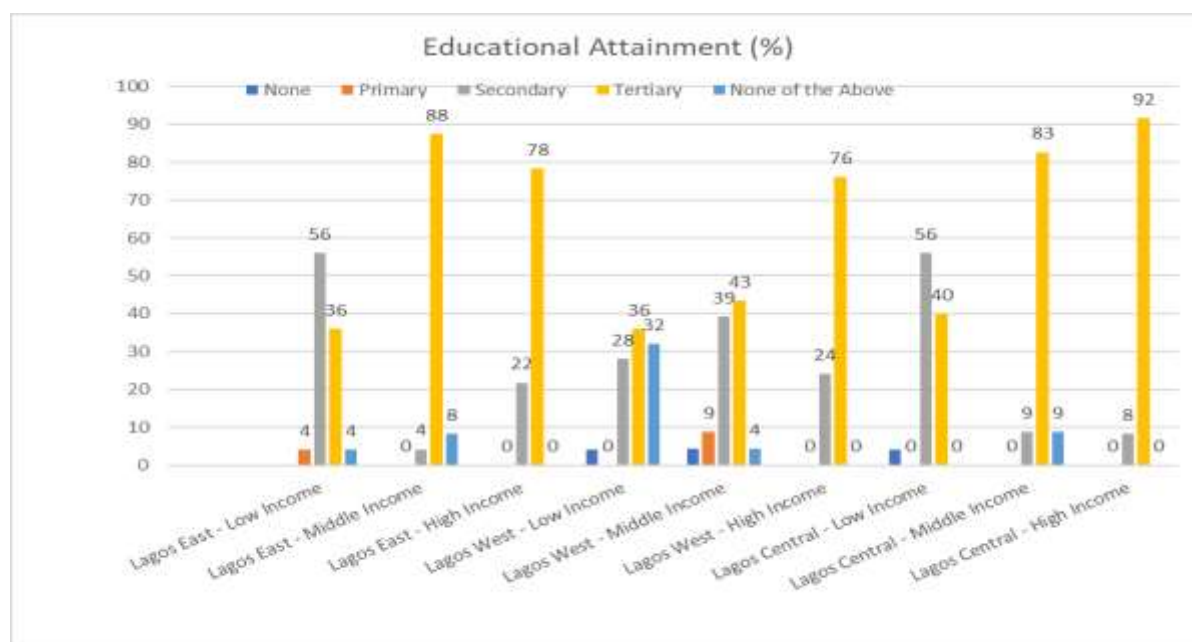
Figure 4.3*Highest Educational Attainment of Respondents*

Figure 4.4 shows that the position of the head of household and the householders among the respondents were almost evenly distributed. The distribution showed that 52.58% of the respondents were heads of households while 47.42% were members of the households.

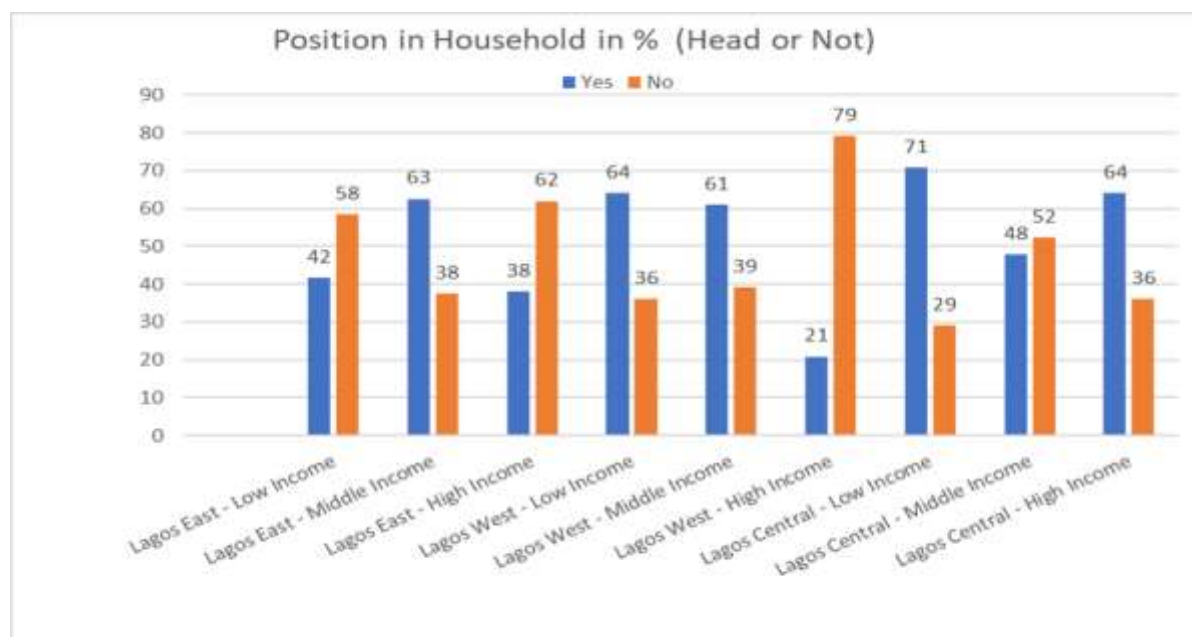
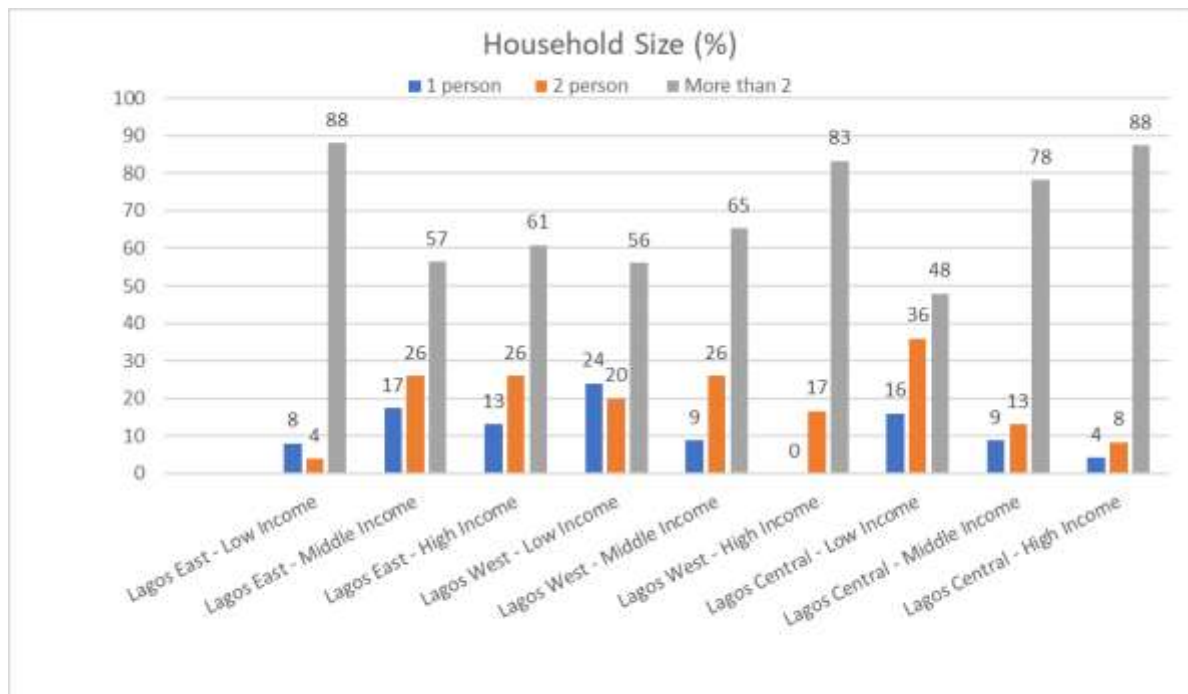
Figure 4.4*Positions of Respondents either as Head of Household or a Member*

Figure 4.5 indicates the nature of dwelling in terms of the number of occupants, whether it was a single person, two (2) persons or a more than two persons dwelling unit. The result showed that a high percentage of the respondents have households dwelling unit with more than two (2) persons as household members. Approximately 70% of respondents live in households with more than two persons in the dwelling units while 30% of respondents were either in a single person or two persons dwelling unit.

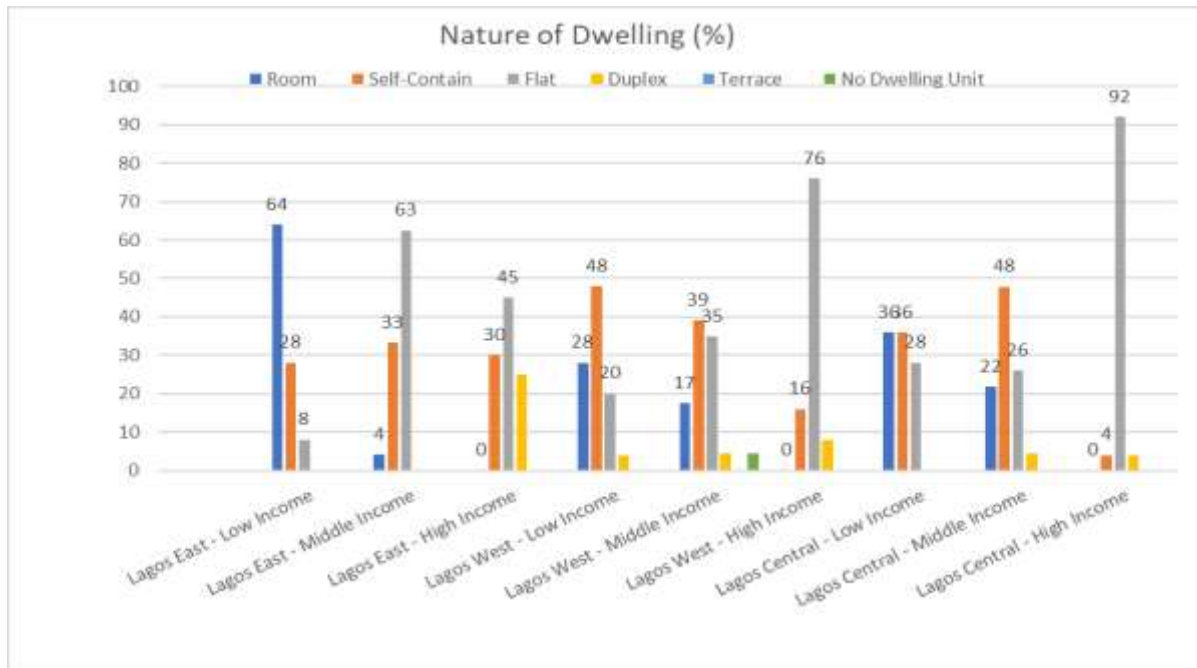
Figure 4.5

Respondents on Household Size



The nature of dwelling units (Figure 4.6) in terms of the structure and content, whether they were room systems [external toilet and kitchens, self – contained (a room with enclosed toilet and kitchen facilities)], a flat system [one living room/parlour and one or more bedroom(s) with toilet and kitchen enclosed], duplex system, terrace or not having a dwelling unit.

Figure 4.6 *Nature of Dwelling*



This dwelling unit partly gives indications of socio – economic status of the area and the social classing of dwellers among other things. About 43.3% of the respondents live in a flat system, 31.5% lives in self – contained dwelling unit, followed by those respondents dwelling in a room system (19.7%). Only about 5.1% of respondents live in a duplex system of dwelling while no respondent lives in a terrace dwelling system. Of all the respondents, one claimed (0.40%) not to have a structured dwelling. The result is as shown in Figure 4.6.

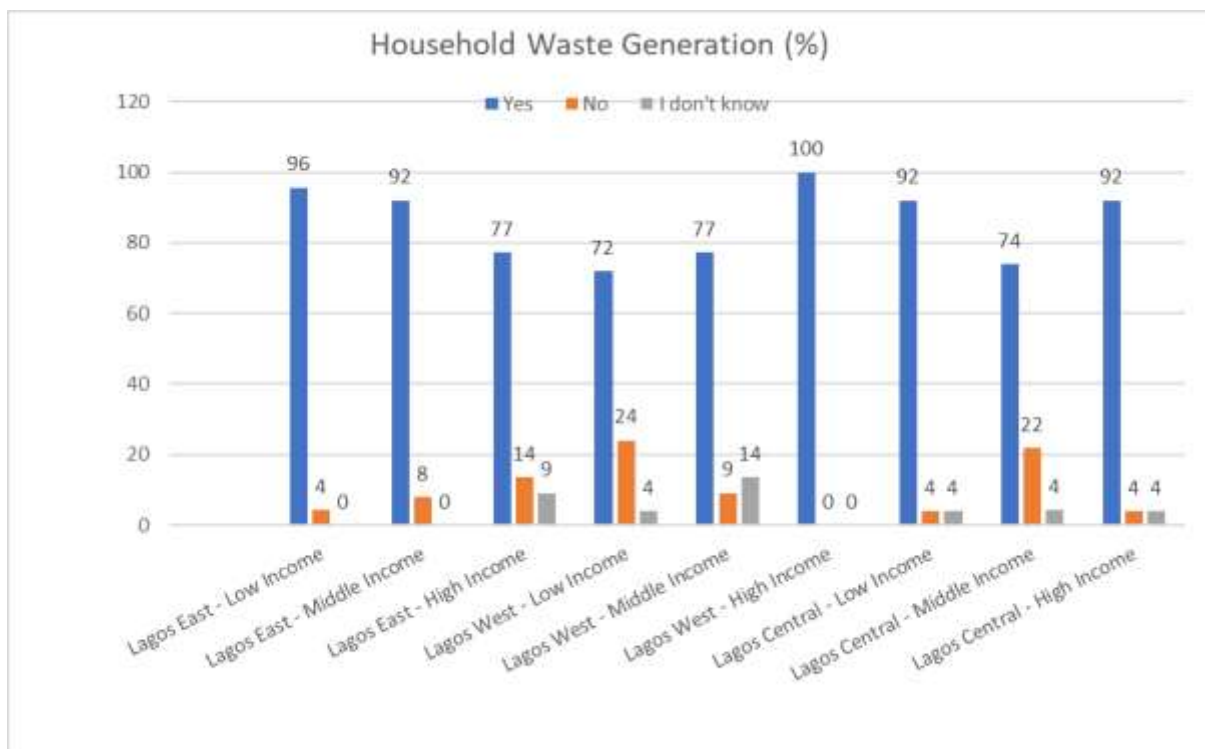
Knowledge of Solid Waste/Generation/Management

The information from the sections following is on the knowledge of the respondents on the general solid waste generation and management within and around the household dwellings and the immediate municipal solid waste management practices. It entailed determining how the respondents as the first handlers of household waste temporarily treat the generated waste of the household. Good containerization of waste at household level can go a long way to indicate how the households think generally toward more sustainable solid waste management within the community.

An overwhelming percentage of respondents acknowledged that municipal solid waste was generated (86%). It is also worthy of mentioning that about 10% of respondents claimed that their household did not generate municipal solid waste, while about 4% of the respondents claimed they do not know if the household did generate municipal solid waste or not (see Figure 4.7).

Figure 4.7

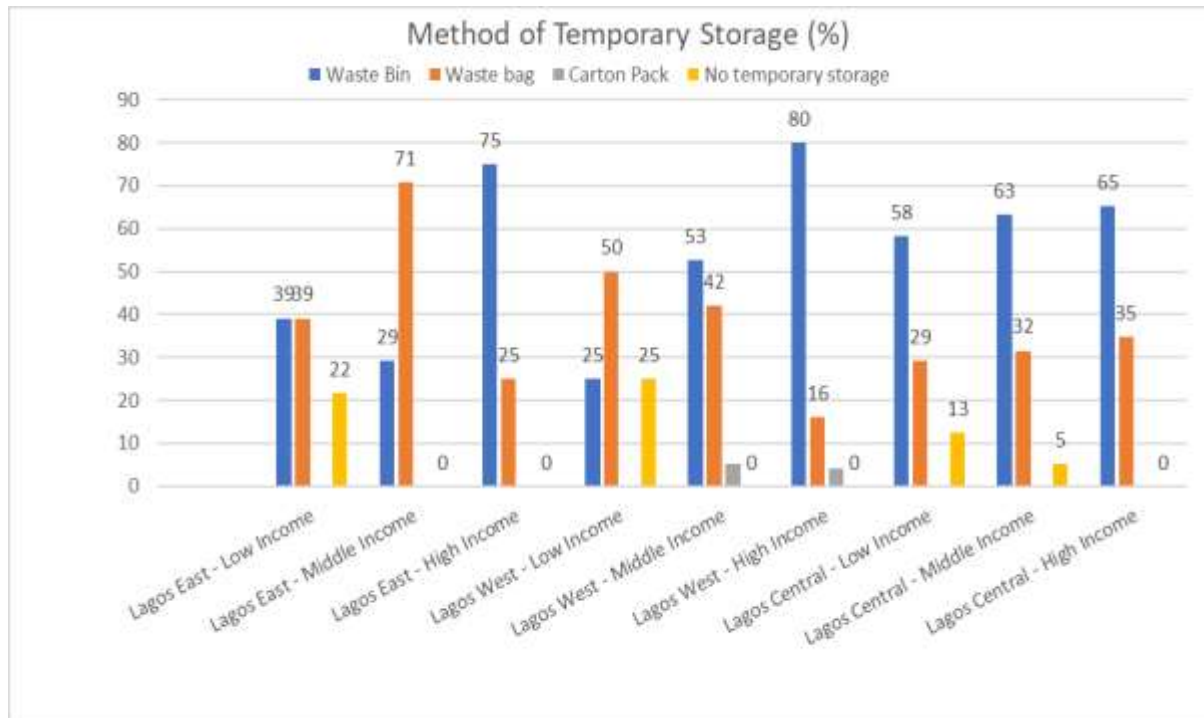
Solid Waste Generation by Households



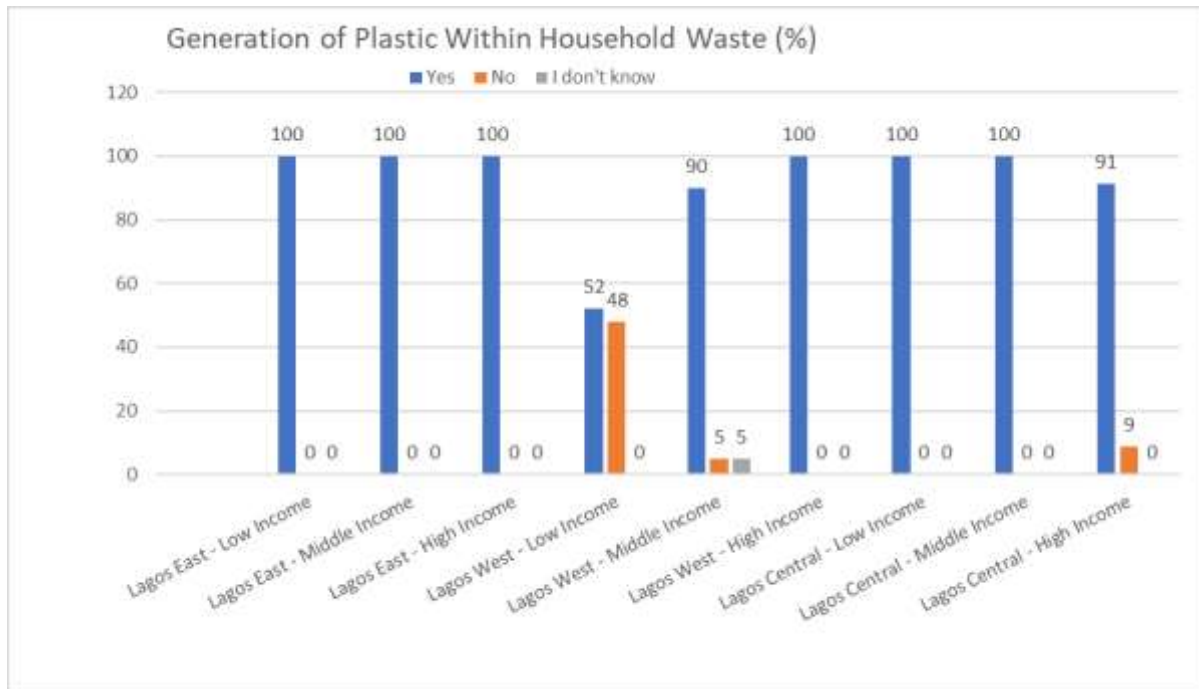
On the aspect of temporary solid waste storage, about 50% of the respondents use waste bins/baskets as a means of waste storage, while 35.7% use waste bags and only about 1% used carton. Meanwhile, around 7% of the respondents claimed they do not temporarily store municipal solid waste within the dwelling unit (see Figure 4.8).

Figure 4.8

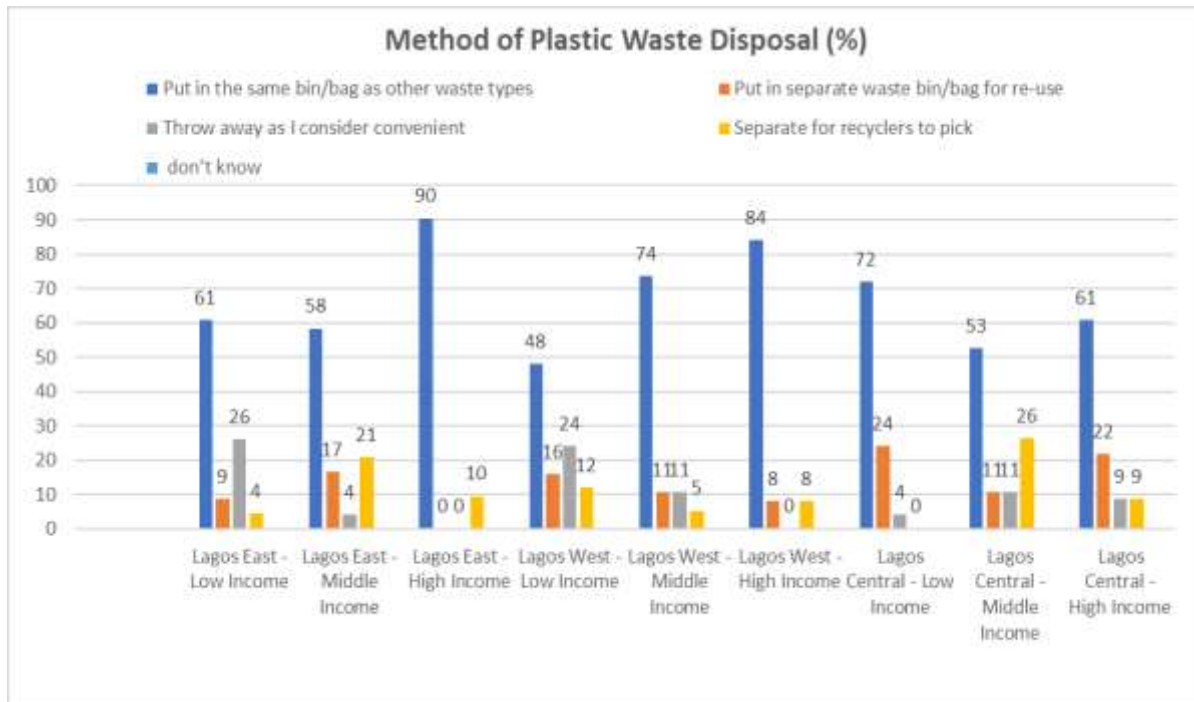
Temporary Storage of Municipal Solid Waste within the Dwelling Units



The majority (92.1%) of the respondents acknowledged that plastic waste is a fraction of their municipal solid waste generated by the households. However, a seeming outlier was observed from the result from Lagos West District around a LI stratum where half of the respondents claimed they do not generate plastic waste in their household (Figure 4.9).

Figure 4.9*Representative of Plastic Waste Generation by Households*

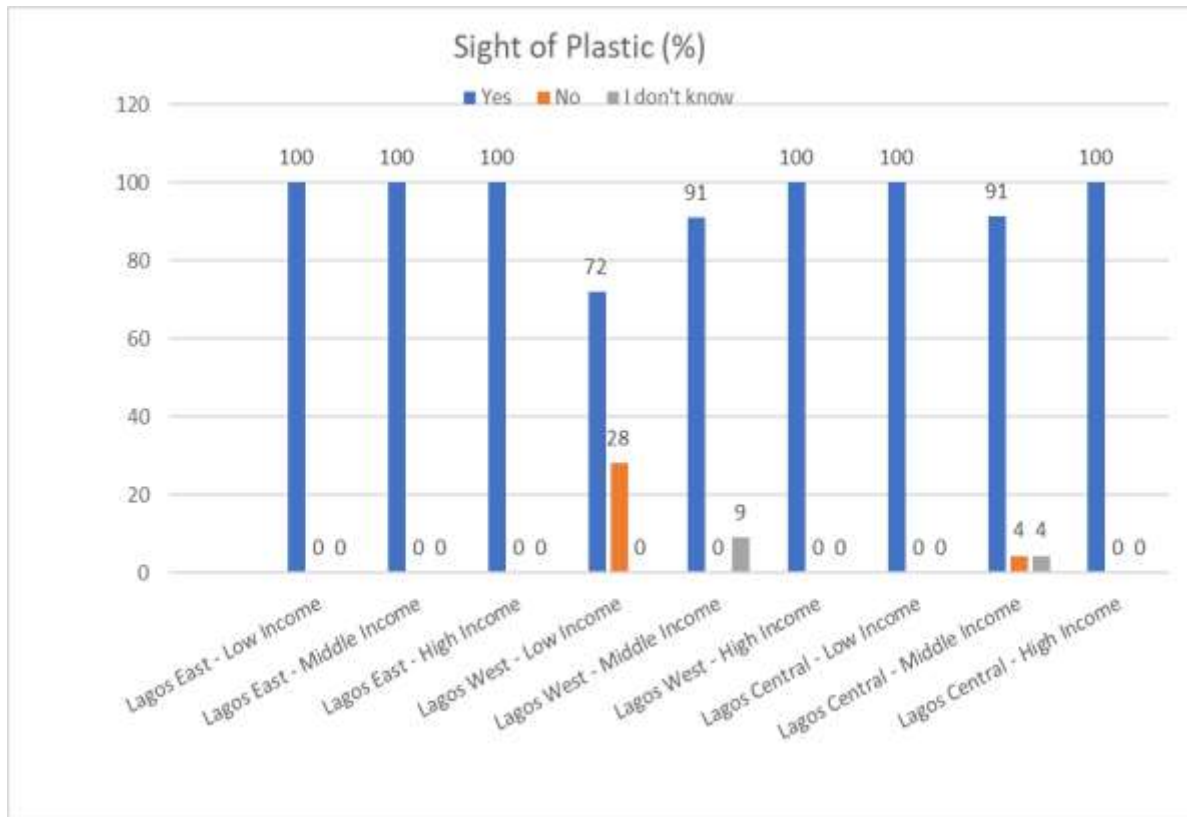
The majority (64%) of the respondents' dispose of the plastic waste together with other household waste. Hence the majority of the respondents comingle the generated waste (see Figure 4.10). The percentage of those who separated the plastic waste from other waste types for possible re – use stood at around 13%, those who cannot account for how they treat the plastic waste or throw it away as they consider convenient are around 10%, while 9% claimed they separate the plastic waste from other waste for recyclers to pick. Around 4% of respondents did not attend to the question.

Figure 4.10*Method of Plastic Waste Disposal by Households*

The plastic waste can almost be said to be ubiquitous within different parts of the metropolis and it is reasoned that it is worth finding out if the respondents noticed that. The results showed that about 95% of respondents claimed to have seen plastic waste around public places within the metropolis. While 4% of the respondents claimed that they never noticed plastic waste within the public places while the remaining 1% could not say if they had seen such or not and the findings is as represented in Figure 4.11.

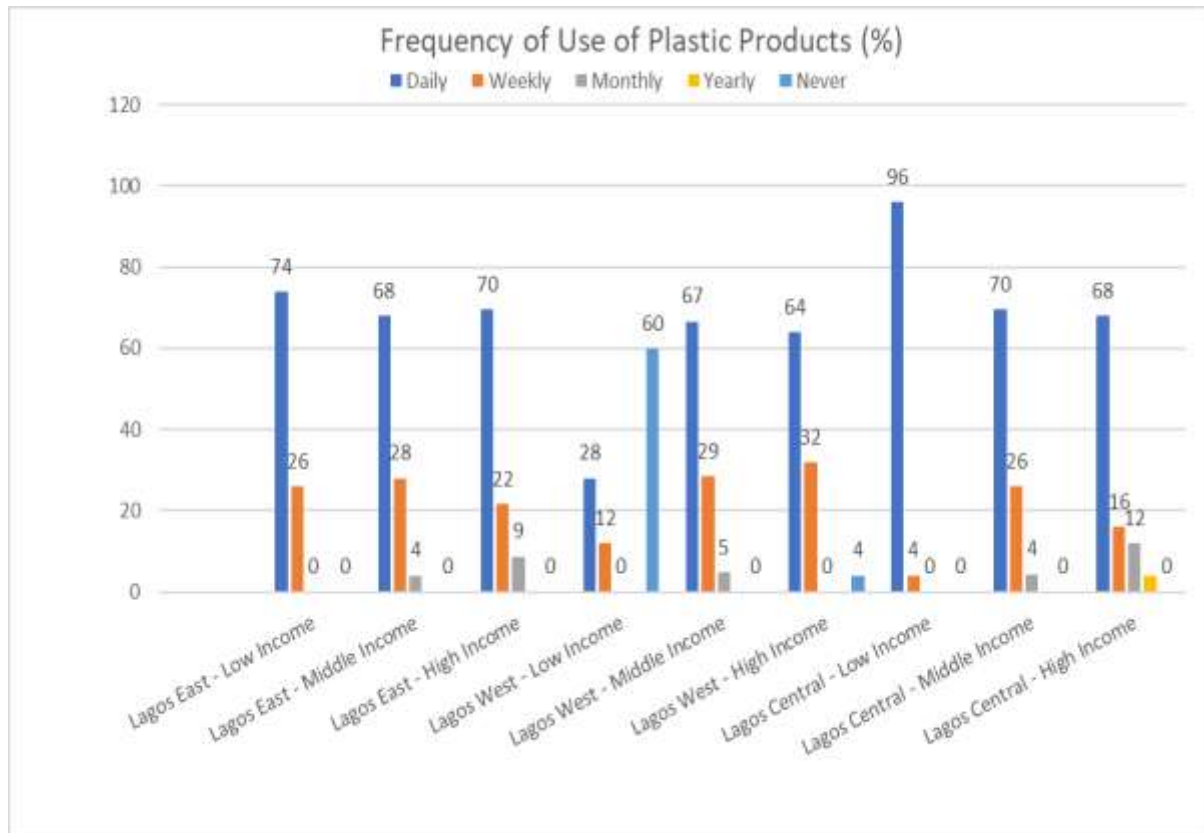
Figure 4.11

Respondents who have seen Plastic Waste within the Metropolis

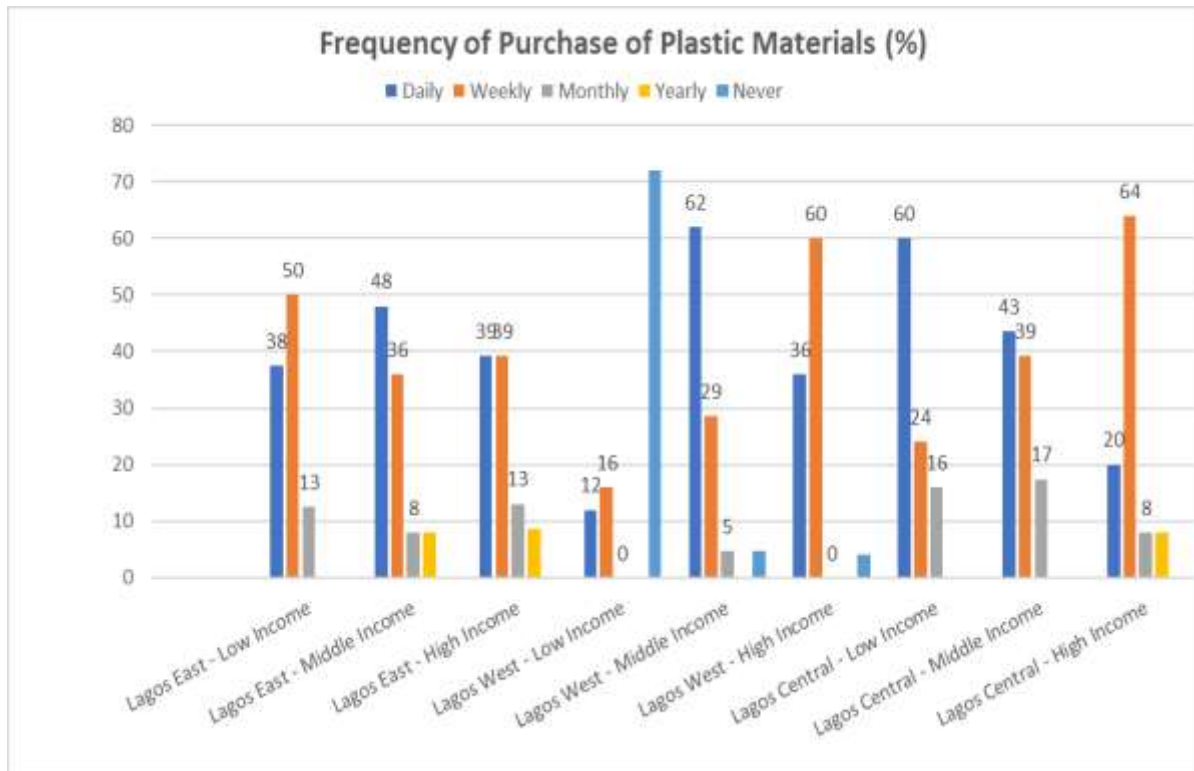


However, a seeming outlier was observed in the result of Lagos West District of the LI stratum where 28% of the respondents claimed they have never seen plastic material within the metropolis (see Figure 4.11).

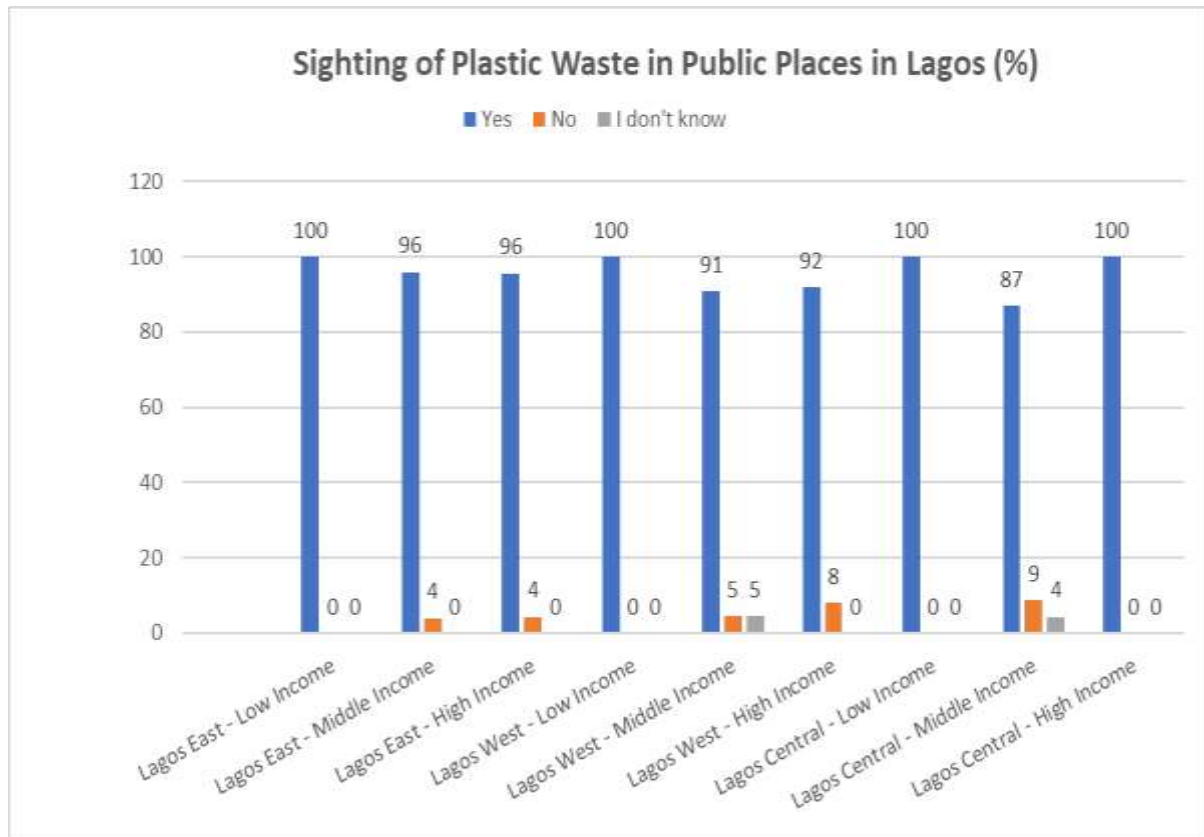
Almost all had used plastic apart from the suspected outlier from the LI – West respondents where 60% of the respondents claimed they have never used plastic materials (Figure 4.12). Most of the respondents (64%) use plastic materials on a daily basis while 21% use the materials on weekly basis and about 4% use it monthly. However, around 7% claimed not to have ever used plastic (Figure 4.12).

Figure 4.12*Previous Use of Plastic Products/Materials*

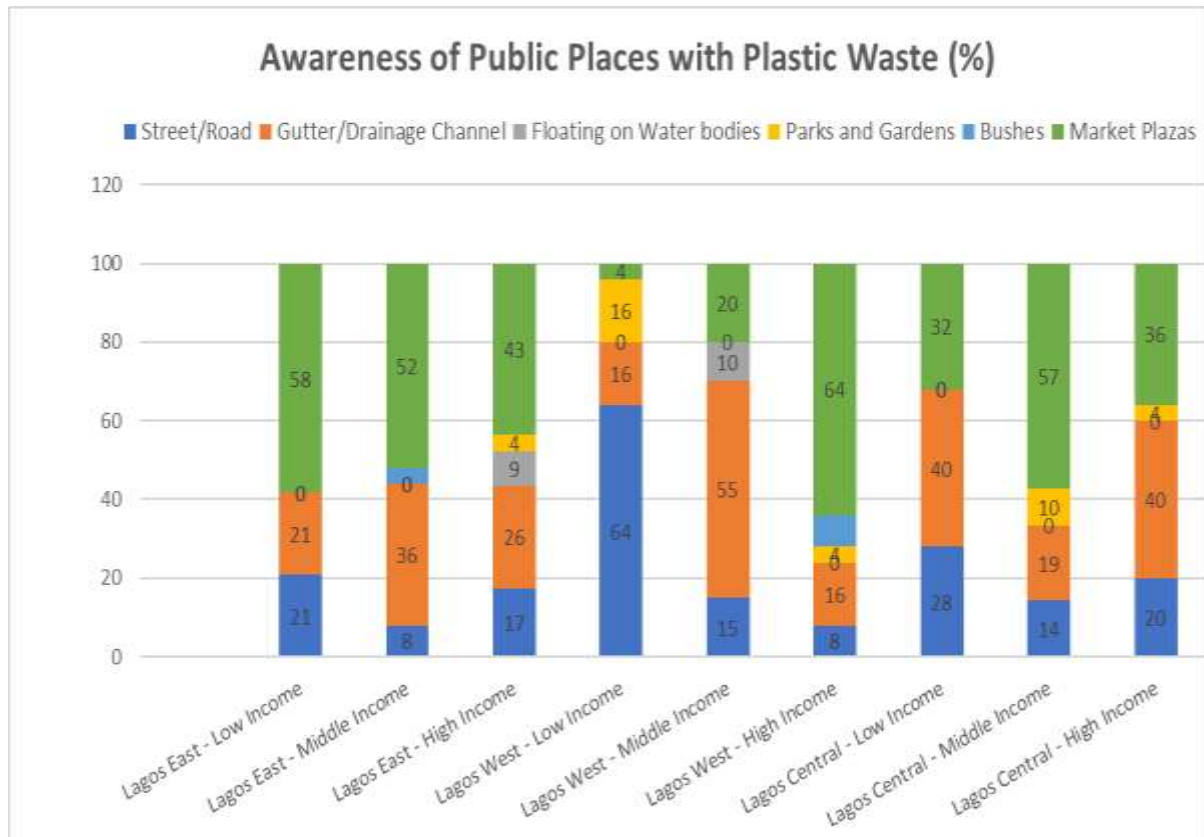
Most (86.4%) of the respondents buy plastic materials within one year, though at different frequencies. For instance, 39.4% of the respondents buy plastic materials on a daily basis while 39.8% buy on a weekly basis and 8.8% monthly while 2.8% buy on yearly basis. About 9.3% claimed they never bought plastic materials (Figure 4.13).

Figure 4.13*Frequency of Purchase of Plastic Materials*

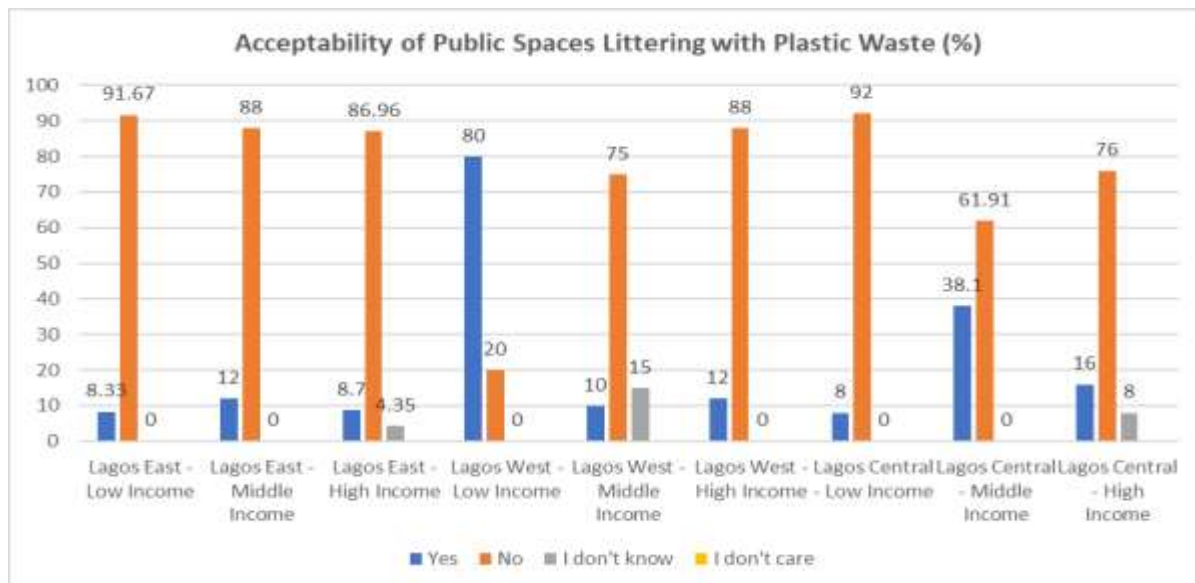
Most respondents (95%) have observed plastic waste littering at different environments in the study area. Less than 4% of the respondents claimed not to have noticed plastic waste littering around the environment of the metropolis (see Figure 4.14).

Figure 4.14*Knowledge of Respondents on Plastic Waste Littering in Lagos*

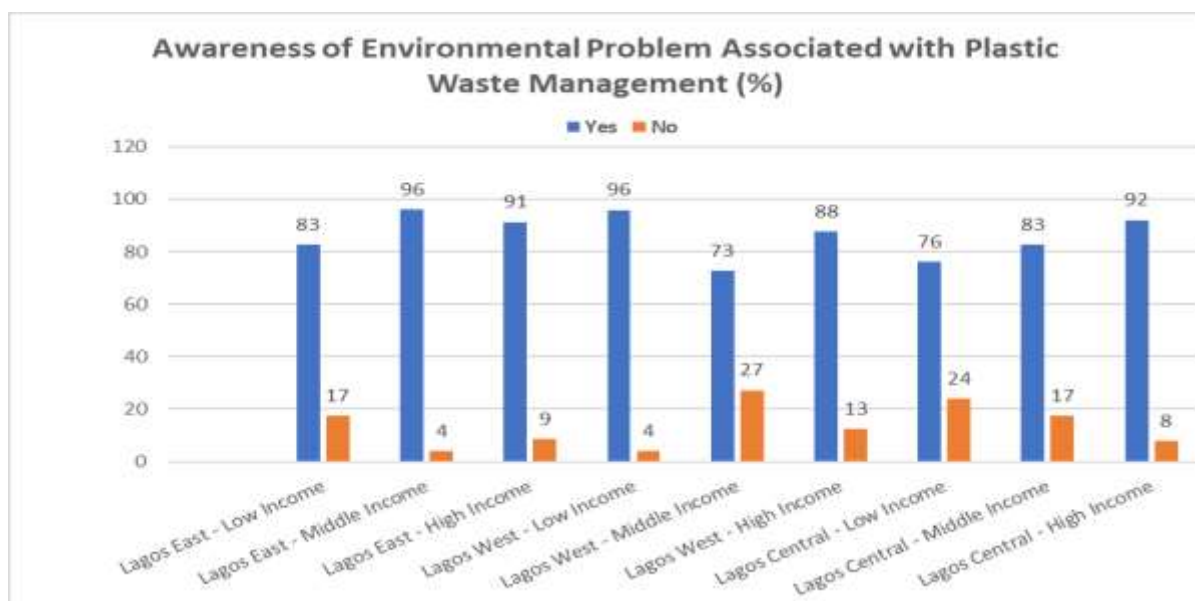
Further, about 40.8% mentioned observing plastic waste littering around the market area, 29.6% saw them in the gutters/water drainage, 22.1% observed them on the street/roads. The remaining percentage observed the nuisances floating on bodies of water, in bushes, parks and gardens (4.15).

Figure 4.15*Observation of Plastic Waste Littering*

Reasoning on the acceptability of plastic waste littering within the metropolis showed that the majority of the respondents (85.6%) said that the presence of plastic waste in public places is not good except for a seeming outlier from Lagos West District in the LI stratum (Figure 4.16).

Figure 4.16*Acceptability of Public Spaces with Plastic Waste*

An overwhelming majority (86.5%) of the respondents claimed they are aware of the environmental problems associated with plastic waste mismanagement as shown in Figure 4.17.

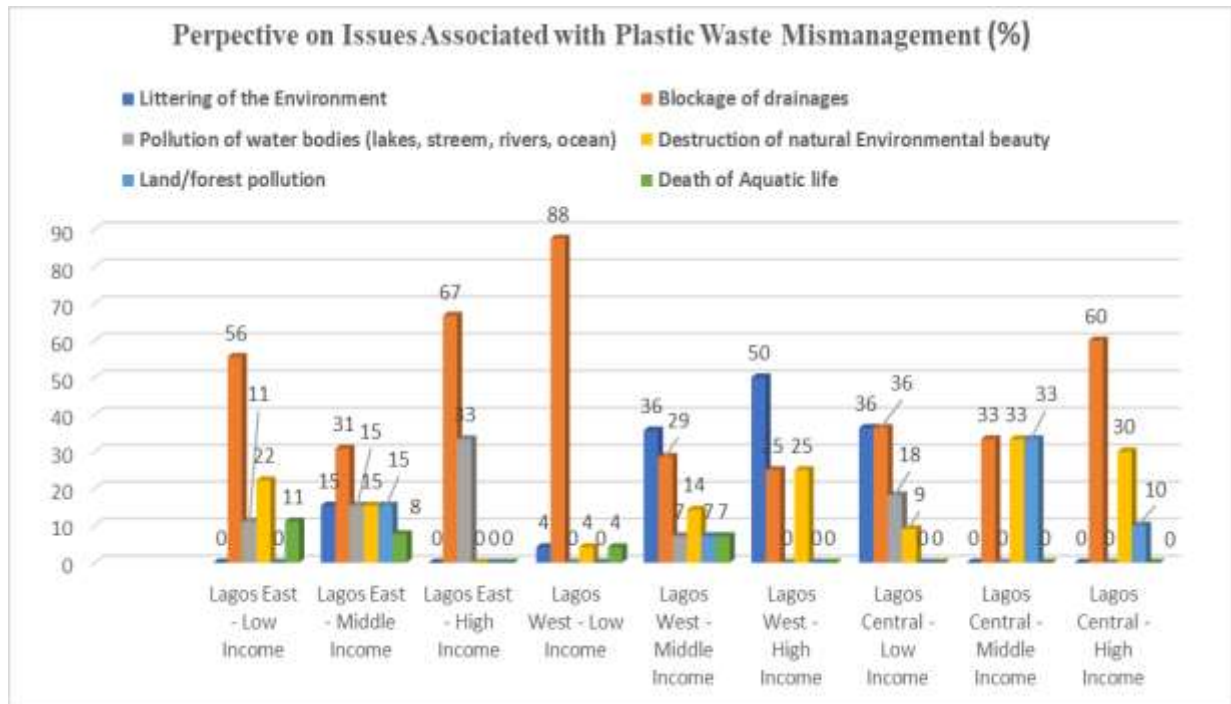
Figure 4.17*Awareness of the Environmental Problem Associated with Plastic Waste Mismanagement*

For environmental and social issues associated with plastic waste mismanagement, it was mentioned that it involved the littering of the environment, blockage of drainages, and

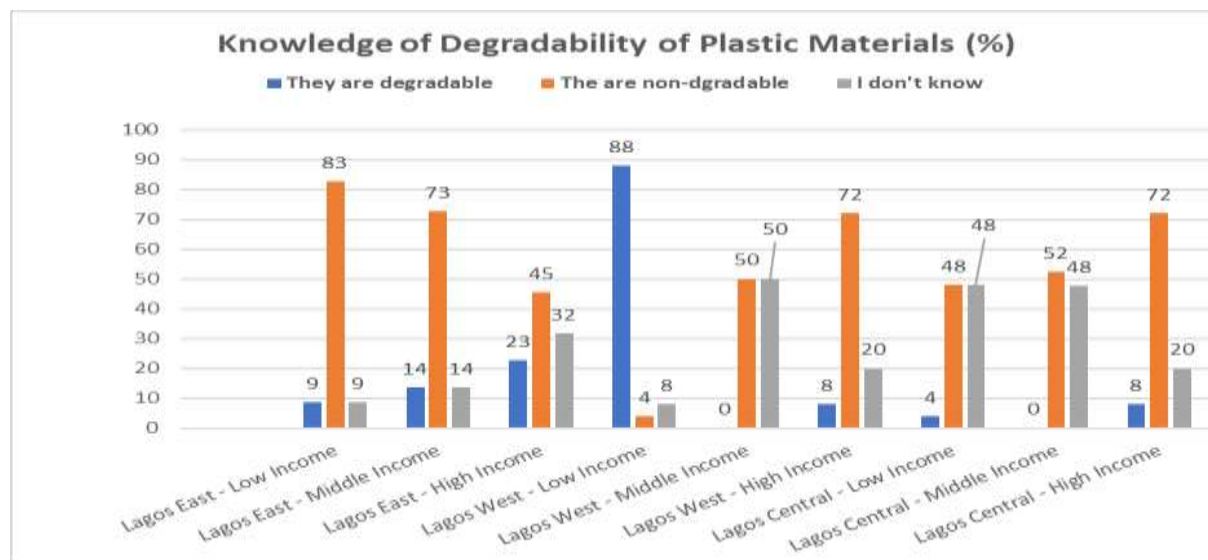
pollution of water bodies (lakes, streams, rivers, and oceans), destruction of natural environmental aesthetics and the death of aquatic life (see Figure 4.18).

Figure 4.18

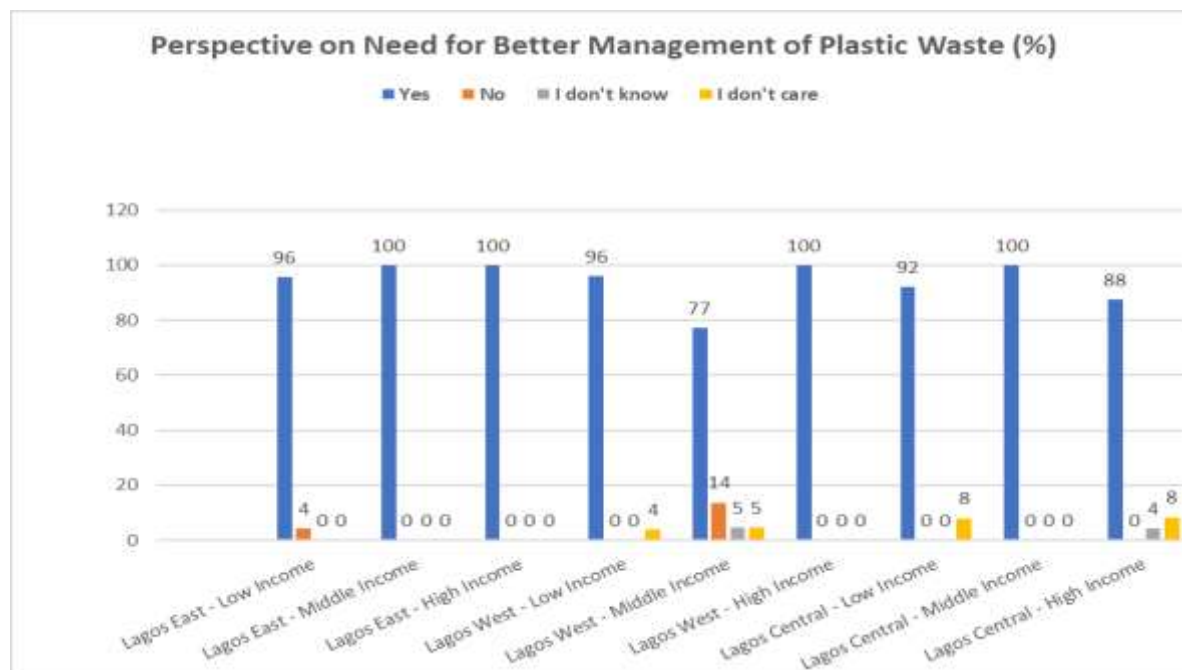
Perspective on Issues Associated with Plastic Waste Mismanagement



Most (53%) of the respondents claimed that plastic waste/materials are non – degradable while around 17 % said that they are degradable and the remaining claimed they do not know if they were degradable or not (Figure 4.19).

Figure 4.19*Knowledge of Degradability of Plastic Materials***Perceptions and Attitudes towards Sustainable Plastic Waste Management**

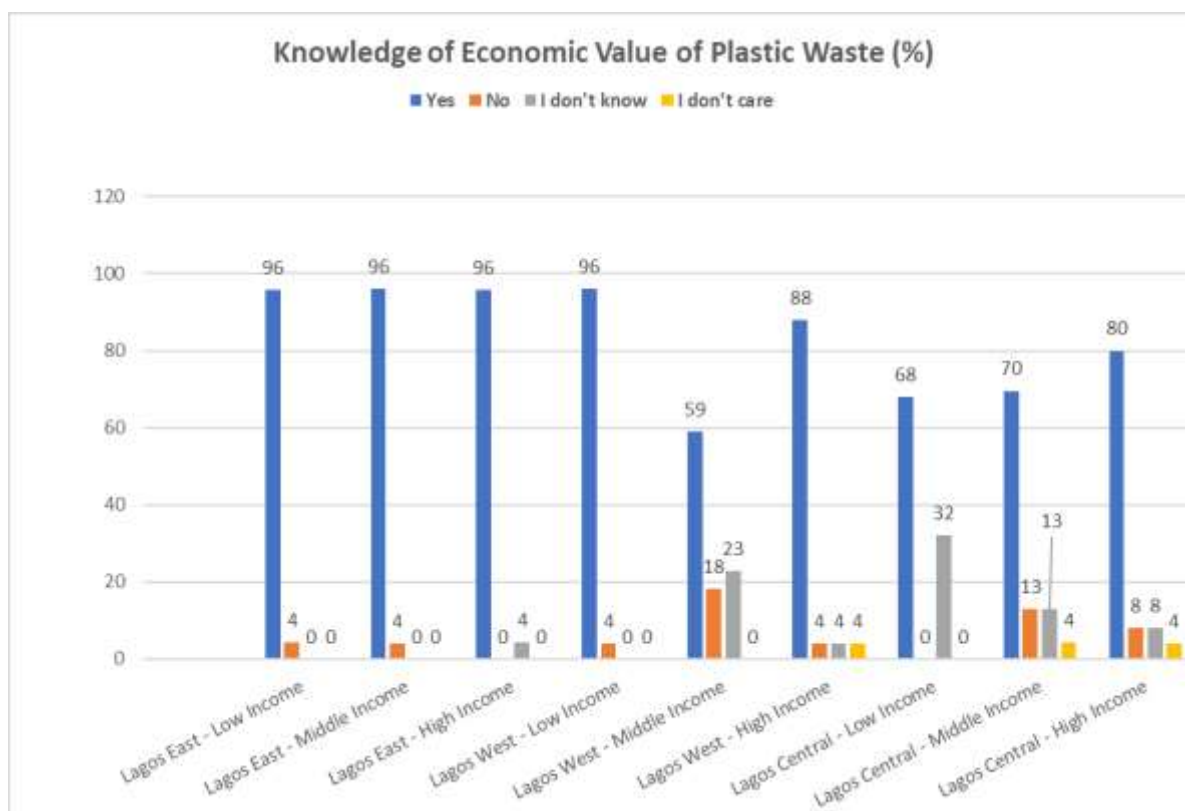
The majority of the respondents (94%) asserted that there is a need for better management of plastic waste in Lagos (see Figure 4.20).

Figure 4.20*Perspective on the Need for Better Management of Plastic Waste in Lagos*

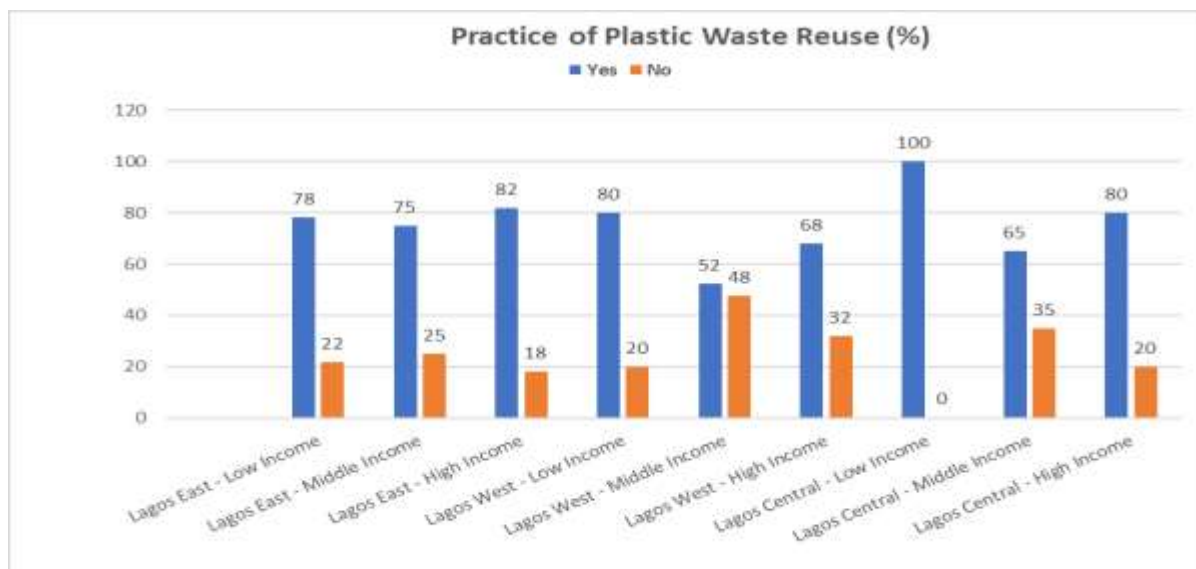
The way people treat a waste material is sometimes tied to the value placed on the material. Among the evaluated is the knowledge that plastic waste has economic value and it turned out that an overwhelming percentage of respondents (83.33%) acknowledged knowing that plastic wastes have economic value (see Figure 4.21).

Figure 4.21

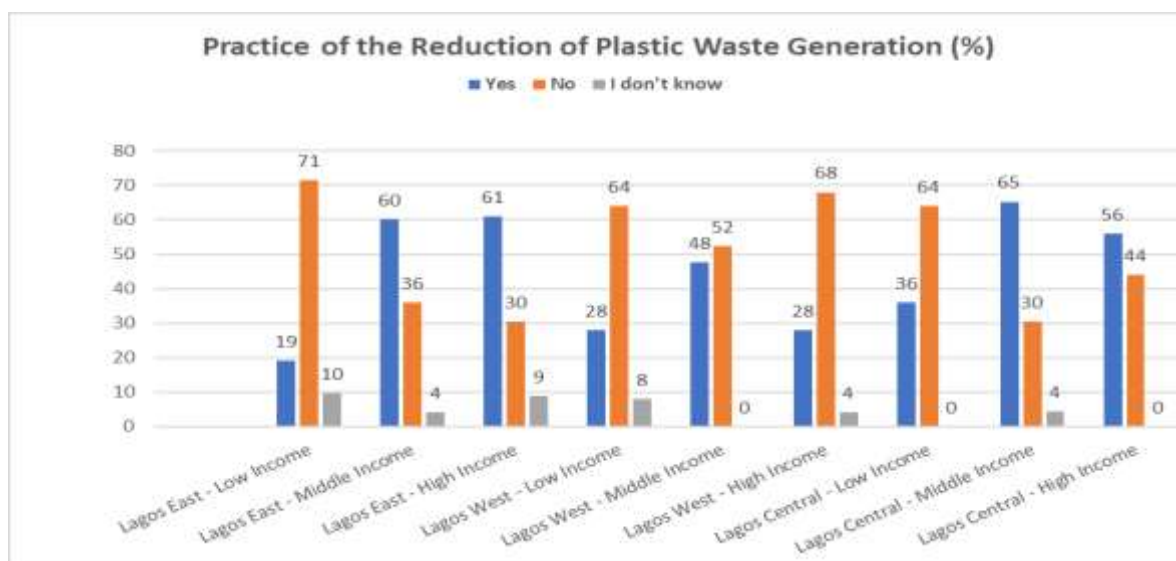
Knowledge of Economic Value of Plastic Waste



Concerning the possible practice of plastic reuse by respondents, most (76%) attested to the practice of the reuse of plastic waste at times within the household dwelling (Figure 4.22).

Figure 4.22*Practice of Plastic Waste Reuse*

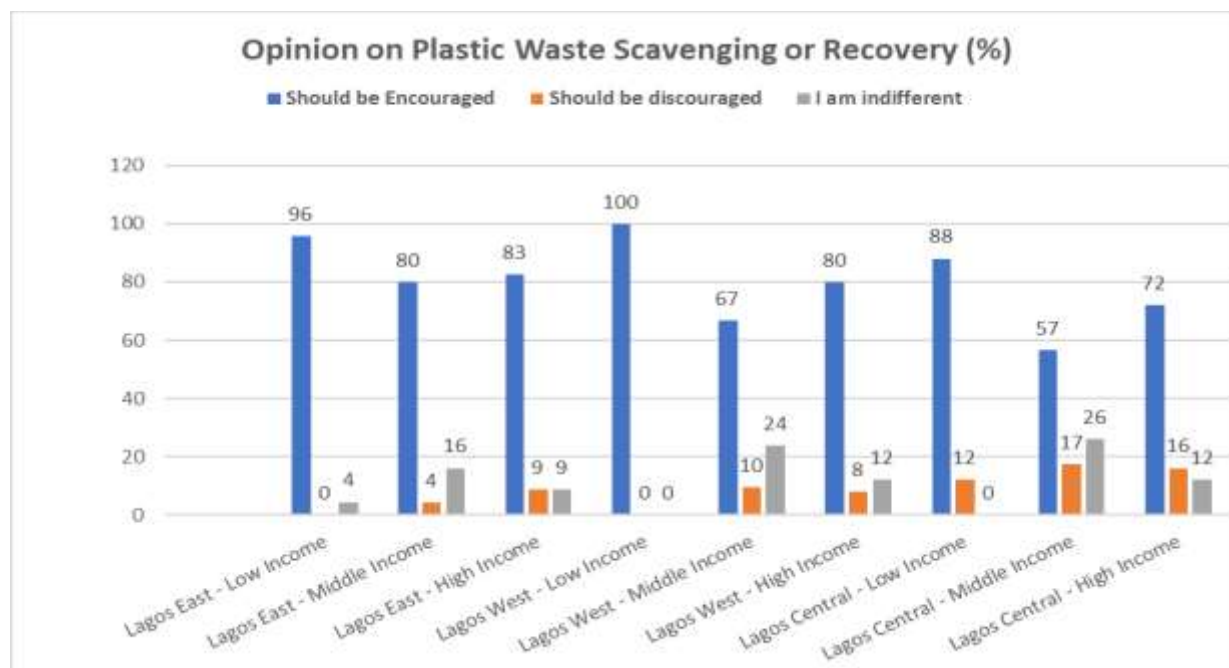
The majority (50%) of respondents attested that they never made personal or deliberate effort to reduce plastic waste generation, while around 44% said they have made an effort to actually reduce plastic waste generation. The remaining 6% claimed not to know whether they have made an effort or not to reduce plastic waste generation (Figure 4.23).

Figure 4.23*Effort made towards the Reduction of Plastic Waste Generation*

The next sub – variable dealt with whether plastic waste scavenging should be encouraged or discouraged. The result showed (Figure 4.24) that the majority (81.2%) supported the scavenging, while 8.5% objected to the activity and 11.3% were indifferent.

Figure 4.24

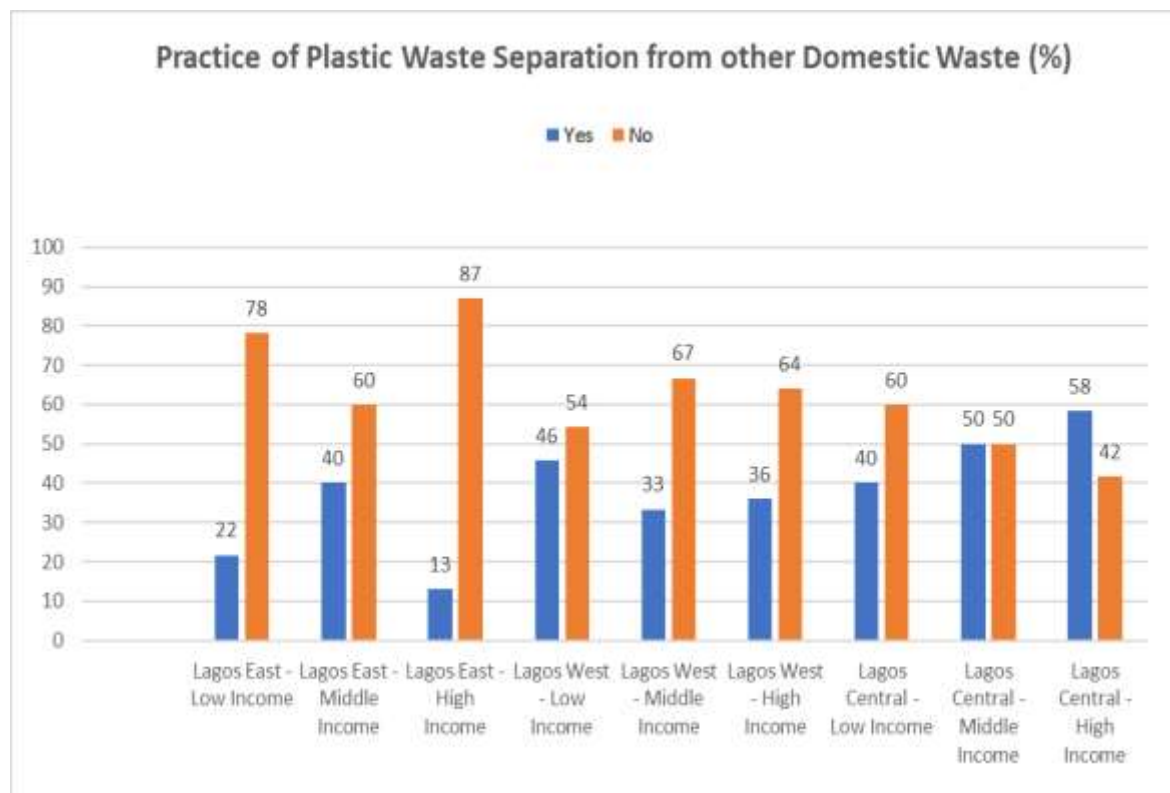
Opinions Concerning Plastic Waste Scavenging or Recovering



Further in line with the preceding, plastic waste separation from other domestic waste was sought, and it was observed that 62% claimed they do not practice plastic waste separation, while 38% practice plastic waste separation (Figure 4.25).

Figure 4.25

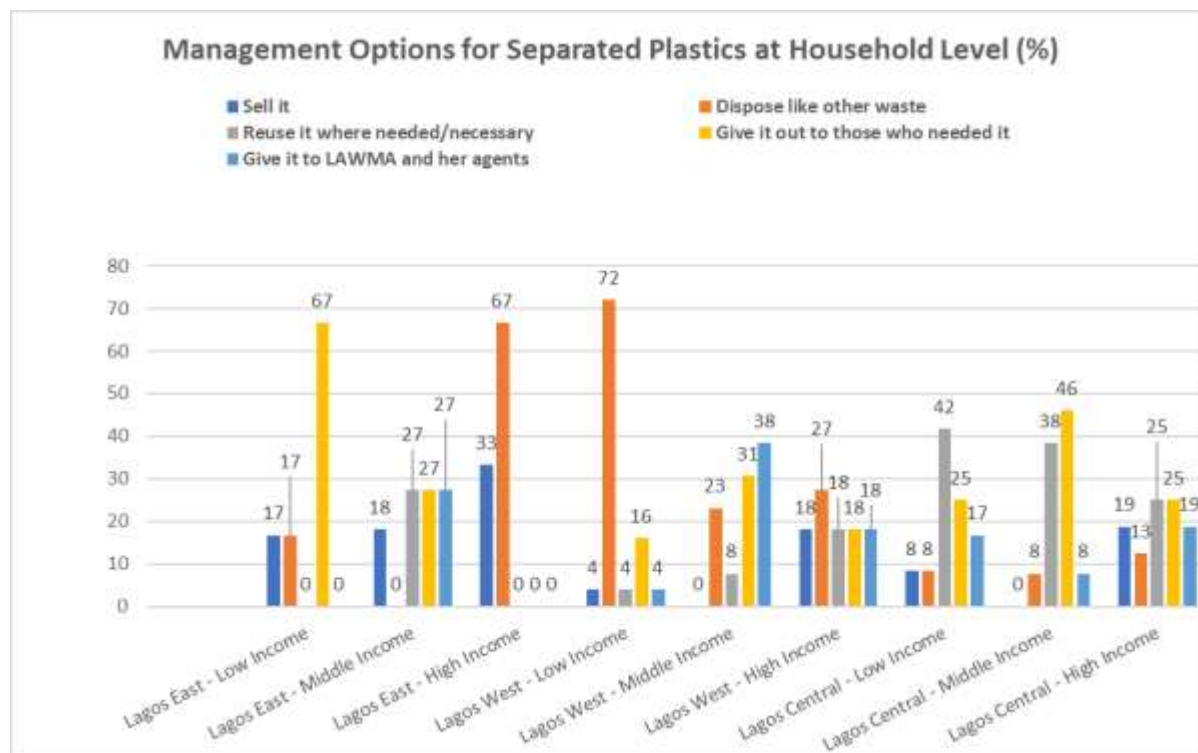
Practice of Plastic Waste Separation from other Domestic Waste



Having separated plastic waste from other domestic waste, it was worthy to know the intention of the separation and the likely fate of the separated plastic. The lowest population (9.90%) of respondents sell the plastic, 28.2% dispose them like other waste, 19.1% reuse it when the need arises, and 27.3% give it to anyone who needs while 15.5% give them to LAWMA appointed PSPs for recycling purposes (Figure 4.26).

Figure 4.26

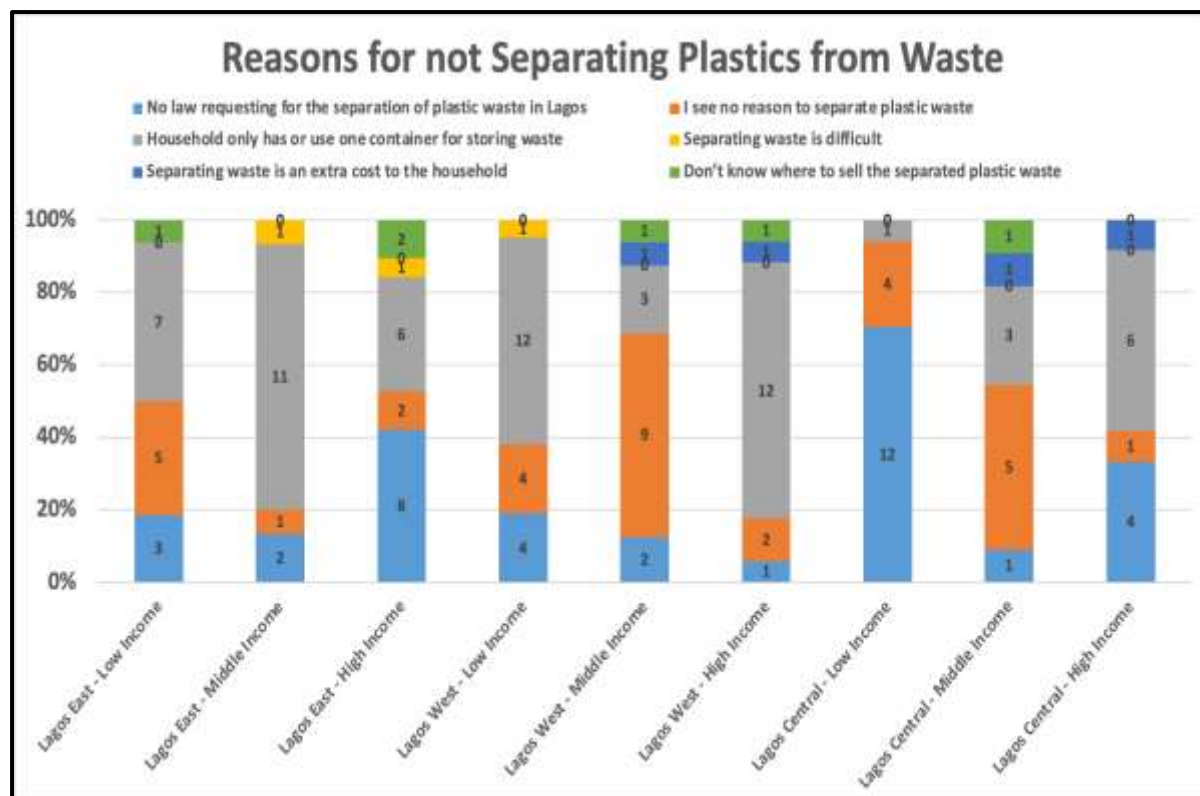
Management Options of separated Plastic at Household Level



For those who do not separate plastic waste, the reason they do not do so was sought and it was shown that 25.7% that do not practice plastic waste separation was because, no law compelled them to separate plastic waste in Lagos (Figure 4.27). About 22.3% saw no reason to separate plastic waste, 42.4% claimed that their household only has or use one container for storing waste, 2.1% said separating waste is difficult, 2.8% reasoned that separating waste is an extra cost to the household, while 4.2% do not know where to sell the separated plastic waste.

Figure 4.27

Reason why Plastic Waste Separation is not Practiced at Household Level

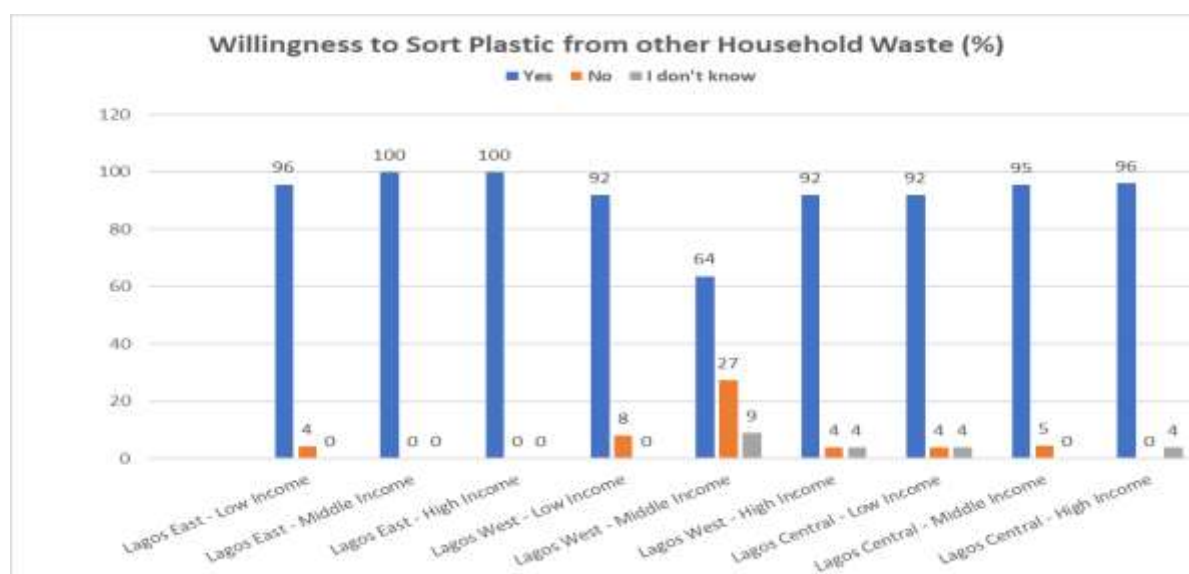


Willingness to Participate in Sustainable Management of Solid/Plastic Waste

The Majority (92.5%) are willing to participate in sustainable solid/plastic waste management, 5.6% indicated their unwillingness to participate while 1.9% were indifferent (Figure 4.28).

Figure 4.28*Willingness to Participate in the Plastic Waste Recycling Programme*

Willingness to implement plastic waste sorting at household level if initiated by the Authority showed that the majority (92.1%) were willing while only 5.6% were not willing to separate plastic at household level while 2.3% were indifferent (Figure 4.29).

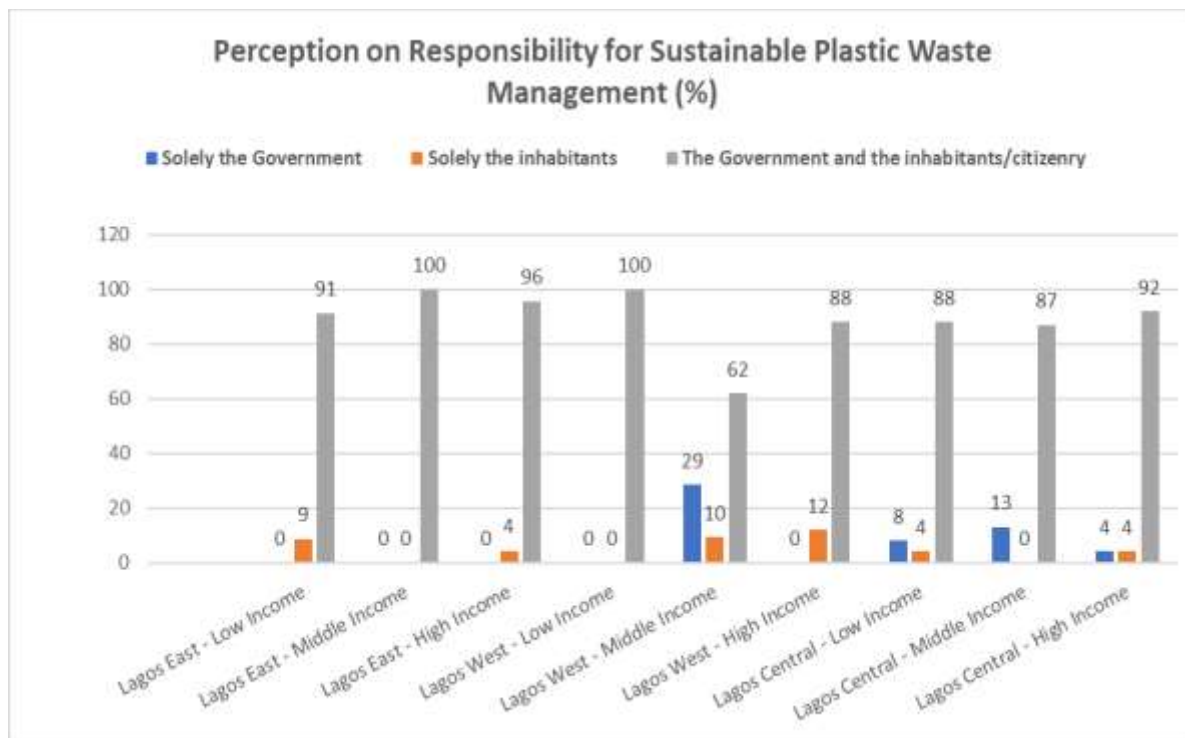
Figure 4.29*Willingness to Sort Plastic Waste at Household Level*

On the issue of whose responsibility to ensure the sustainable management of plastic waste in Lagos; a majority (90.2%) opinionated that it should be the Government and the

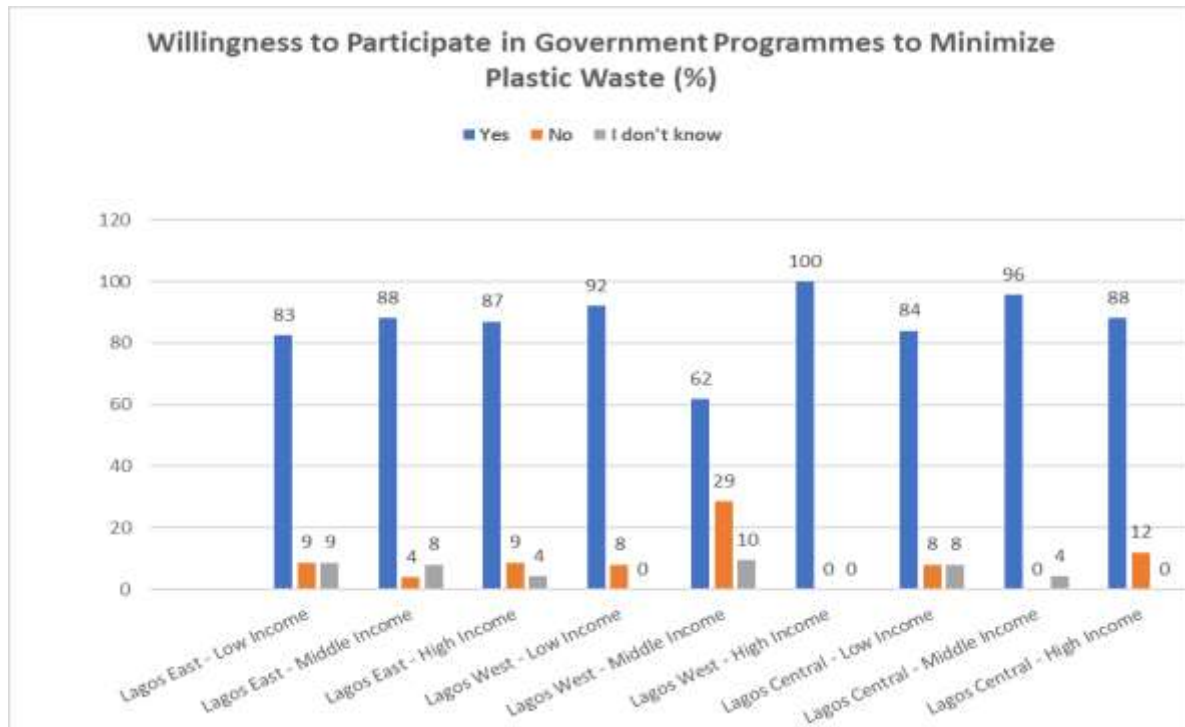
inhabitants/citizenry combined responsibility, 4.7% think it should solely be Government's responsibility, while 5.6% think it should be the sole responsibility of the inhabitants (Figure 4.30).

Figure 4.30

Perception on Responsibility for Sustainable Plastic Waste Management



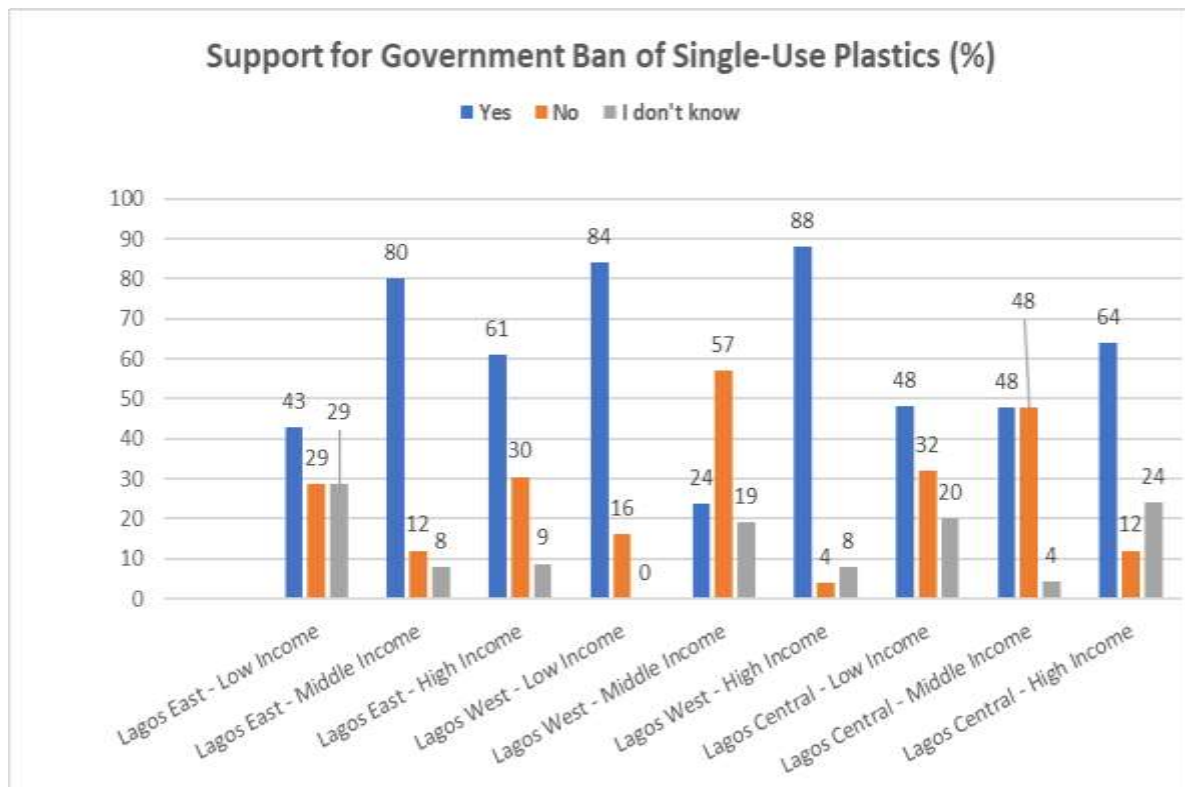
The willingness to participate in any other government – initiated programme geared towards minimizing plastic waste mismanagement in Lagos shows (Figure 4.31) that the majority (87.0%) indicated their willingness to participate, 8.4% were not willing to participate, while 4.6% were indifferent.

Figure 4.31*Willingness to Participate in Minimizing Plastic Waste Mismanagement*

Lagos State Government wants to ban single – use plastics (straw, plastic bags, plastic bottles, wrapper, and disposable plastic materials, etc.), the willingness to comply with intended ban was inquired into. The result (Figure 4.32) showed that the majority (61.1%) were willing to comply, 25.8% were not willing to comply, while 13.1% were indifferent.

Figure 4.32

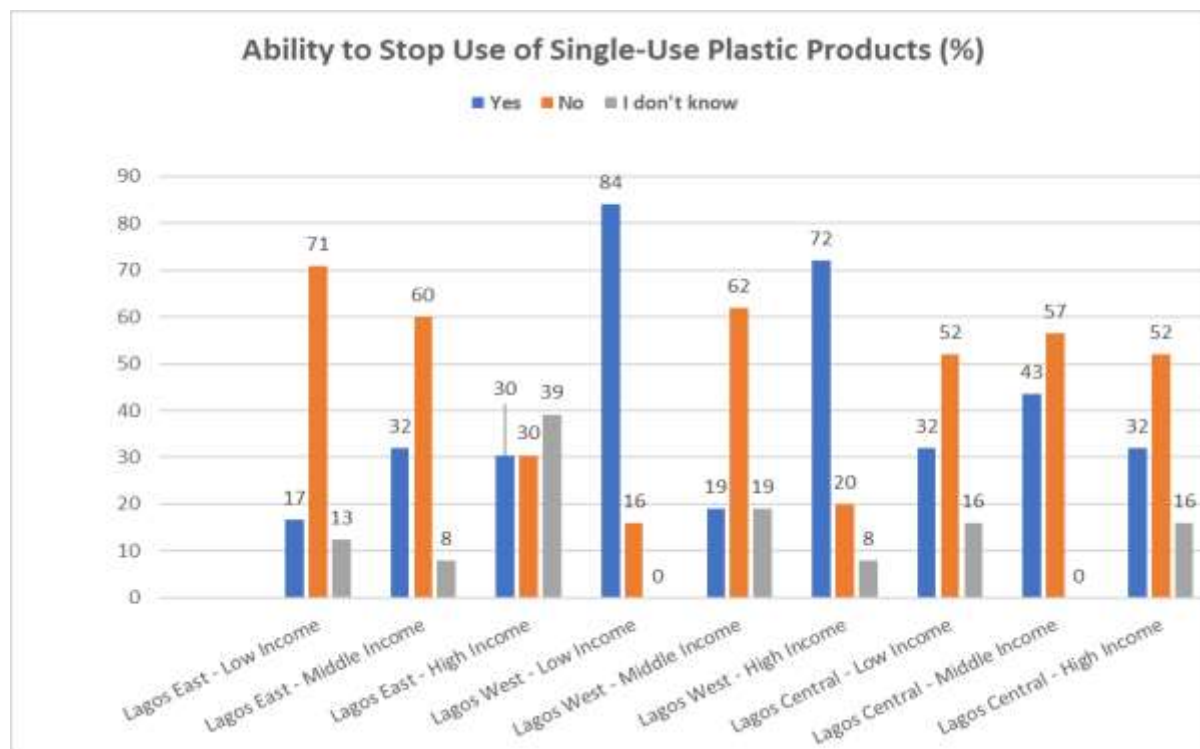
Willingness to Comply with Government Ban of Single – use Plastics



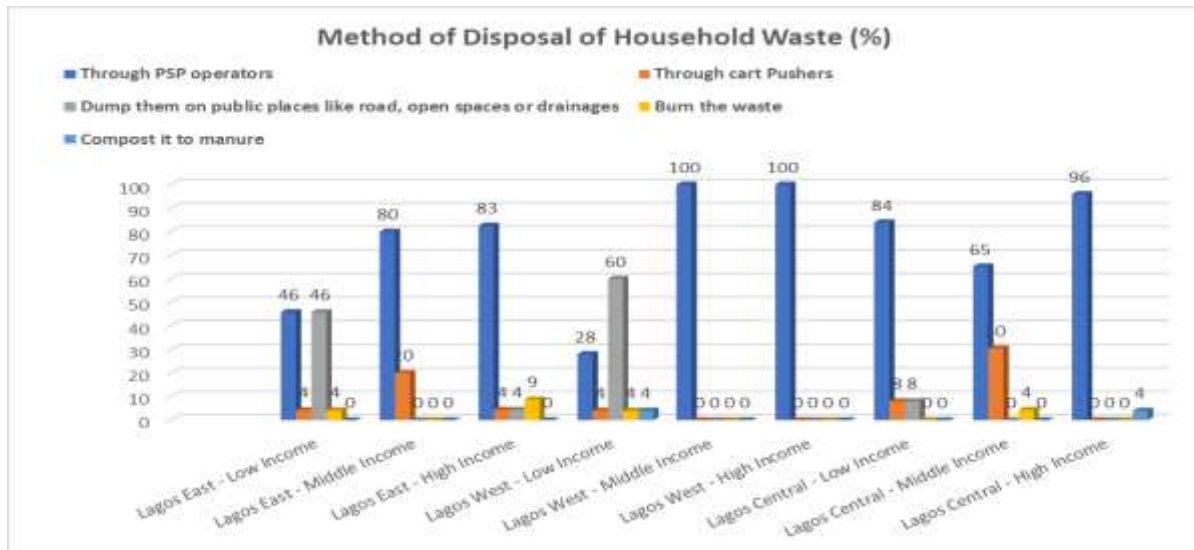
The likelihood of the respondents being able to survive without the use of single – use plastic revealed that 46.3% of respondents believed they cannot cope without the single –use plastic, 40.7% believed they can cope without its use, while 13.0% were indifferent (Figure 4.33).

Figure 4.33

Ability of Respondents to survive without the use of Single – Used Plastics



The findings on how the households dispose of their household solid waste indicated that 75.6% of respondents patronize Government – approved PSPs on waste carting and disposal, 13.4% dump their refuse in public places/spaces, 7.80% use cart pushers, 2.3% burn refuse, while 0.92% compost the waste to manure (Figure 4.34).

Figure 4.34*Method of Disposal of Household Waste*

Waste carting charges is attached to the service provision of PSPs. The majority (80.2%) respondents claimed that they pay for waste carting charges, while 18.9% do not pay for the waste carting fee, and 0.92% do not know if the household paid for waste carting services (Figure 4.35).

Figure 4.35*Household's Payment for Waste Carting Services*

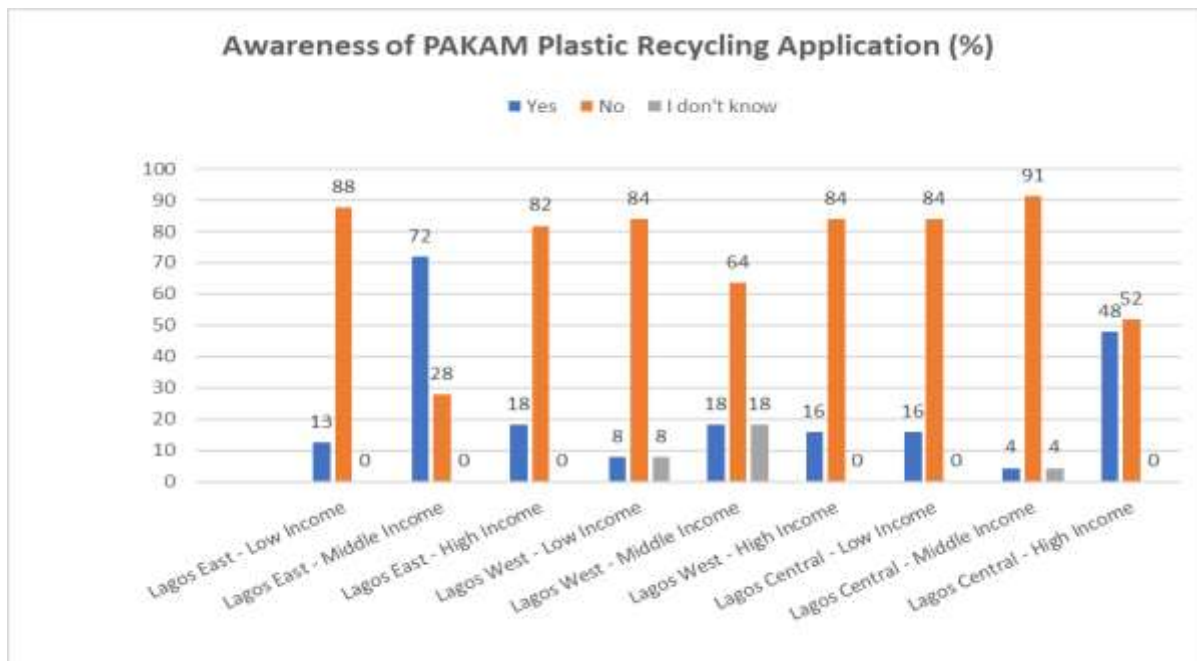
Payment for waste charges has been a controversial aspect of municipal solid waste management value chain in Lagos as some residents believed it is supposed to be one of the social services that government should provide free for the citizens. An inquiry on whether residents should pay for waste services provision to government agents showed (Figure 4.36) that the majority (82.0%) concurred to the payment, 15.6% stood against the payment, while 2.3% were indifferent.

Figure 4.36

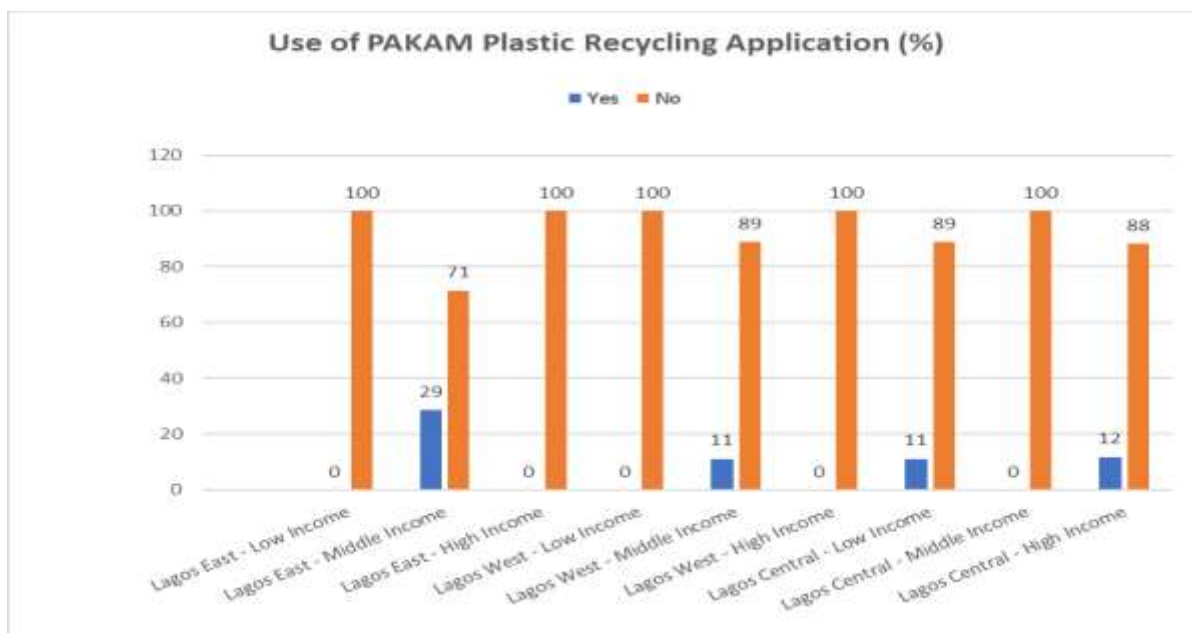
Respondents Opinion on Residents' Payment for Waste Management Services



PAKAM is an App that LAWMA introduced 2021 to ease and encourage the participation of residents in the plastic recycling programme of the State and its popularity was tested. The gathered information showed (Figure 4.37) that 24.1% of respondents have heard of it, most (72.7%) have not heard of PAKAM, while 3.2% could not be certain of hearing or not hearing about the PAKAM APP.

Figure 4.37*Awareness of PAKAM Plastic Waste Recycling Application*

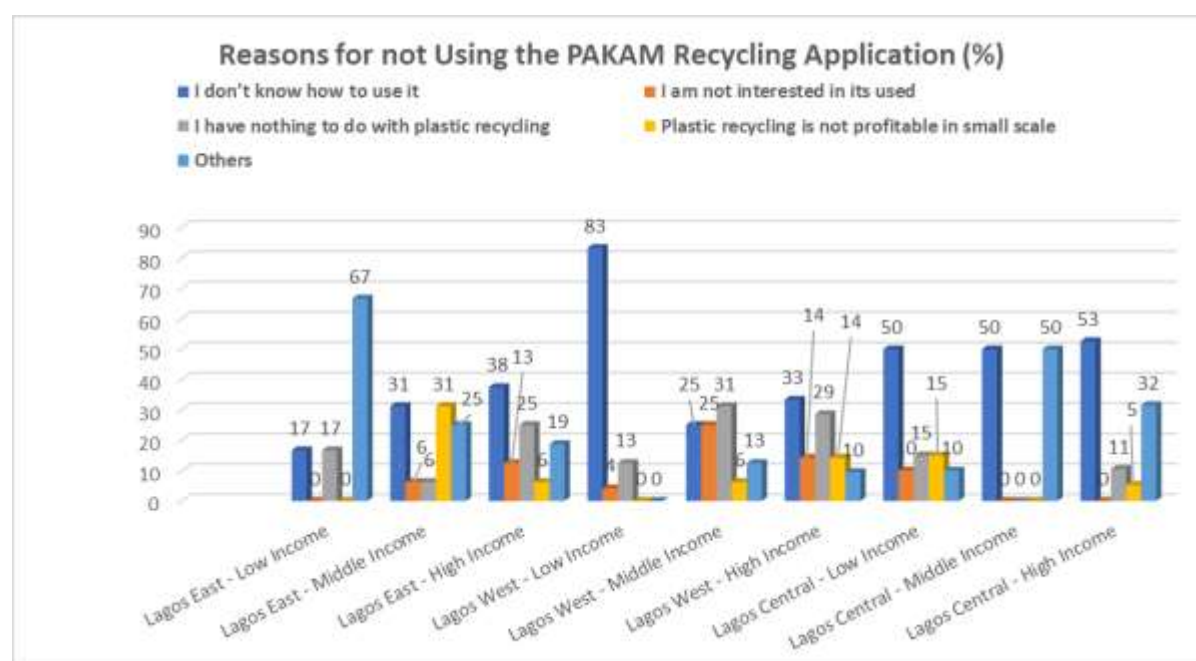
For those who claimed to be aware of the PAKAM App, an enquiry to know if they have used it showed (Figure 4.38) that 91.9% have not used it, while only 8.1% of respondents have used the App.

Figure 4.38*Use of PAKAM Plastic Recycling Application*

Enquiry as to the reason why the respondents who claimed to have heard about the PAKAM App but have not used it showed that 43.8% claimed they do not know how to use the Application. About 22.5% of respondents claimed that they have not used the App for other reasons different from the provided options. Whereas, 16.9% were of the opinion that they do not have anything to do with plastic recycling, while 8.8% claimed that plastic waste recycling is not profitable at a small – scale generation, and 8.1% said they were not interested in its use (Figure 4.39).

Figure 4.39

Reasons for not Using the PAKAM Recycling Application



Solid Waste Management Associations in Study Area

The study used Microsoft Excel software to carry out general descriptive analysis of the data (Section 4.3) gathered to get direct answers to the survey research questions. Using the same software, further insight to some of the research questions were determined across the three socio – economic strata to determine some variations along the socio – economic stratifications. Furthermore, in – depth statistical variations were sought using IBM SPSS Software by doing cross tabulation of variables. Specifically, the cross – tabulation analysis centered on solid

waste management associations with respect to respondents age range, educational status, gender, household position, nature of dwelling unit, residential area, and socio – economic area of dwelling. Chi - square test of independence and correlation tests were determined for the possible relationships of selected parameters and as test of the raised research hypotheses H1 – H5 (1.5.3) amongst others. With a p – value of significance at $p < 0.05$, significant relationships were determined among others. The findings are stated below:

Household Waste Generation

The responses indicating the highest level of solid waste generation was observed in tertiary education, on the 30 – 39 years and 40 – 49 years age groups, by the male gender, heads of households, in a flat system, in Lagos West District, in a high – income area. Solid waste generation increased with increasing educational level, increasing age, across residential areas and with increasing socio – economic status. While solid waste generation decreases with increasing age, household position, gender of respondents and the size of the nature of dwelling. Solid waste generation significantly increased with educational status ($p < 0.05$), across residential areas ($p < 0.05$), socio – economic status ($p < 0.05$). There is a significant decline in solid waste generation with the increase of the nature of dwelling ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; household waste generation and educational level [$\chi^2 (10, N = 217) = 0.00, p < 0.05$]; household waste generation and residential area [$\chi^2 (3, N = 217) = 0.000, p < 0.05$]; household waste generation and increasing socio – economic stratum [$\chi^2 (3, N = 217) = 0.000, p < 0.05$]. Hence, the low educated households, in Lagos Central District and the low socio – economic stratum were less likely to generate household waste than the high educated, those in Lagos West District and at a higher socio – economic stratum. On the other hand, there is a significant positive correlation ($N=217$) between household solid generation and the nature of dwelling ($\tau = 0.030, p < 0.05$).

Temporary Storage of Household Waste

The responses indicating the highest temporary storage of solid waste was observed in tertiary education, on the 30 – 39 years and 40 – 49 years age groups, by the male gender, heads of households, in a flat system, in Lagos West District, in a high – income area. Household storage of municipal solid waste increased with increasing educational level, the size of the nature of dwelling and increasing socio – economic status. While solid waste storage decreased with increasing age, gender of respondents, and household position. Household temporary storage of municipal solid waste was irregular across the residential area. Household waste storage significantly increased with socio – economic status ($p < 0.05$), but decreased with increasing age ($p < 0.05$). While household storage of solid waste was significantly irregular across residential areas ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; temporary storage of household waste and increasing age [$X^2 (24, N = 207) = 0.00, p < 0.05$]; household temporary storage of waste and increasing nature of dwelling unit [$X^2 (20, N = 207) = 0.000, p < 0.05$]; household temporary storage of waste and residential area [$X^2 (6, N = 216) = 0.000, p < 0.05$]; temporary storage of waste and socio – economic stratum [$X^2 (8, N = 207) = 0.000, p < 0.05$]. Hence, the older age groups, in low nature of dwelling, in Lagos East District and in low economic stratum households are less likely to store household waste temporarily than the younger age groups, in high income dwelling units, in Lagos West and Central Districts, in high economic stratum as hypothesized in H2.

Plastic as part of Waste Generated

The responses on the highest level of plastic as part of household waste generation was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in flat system, in Lagos East and West Districts and, in high – income area. Plastic waste as part of household waste generation increased with increasing educational status, but decreased with increasing age, gender of respondents, household position, increasing size of

nature of dwelling, and across residential areas. Households that generate plastic as part of the general waste was significantly irregular with residential area ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; plastic as part of household generated waste and residential area [$X^2 (6, N = 216) = 0.000, p < 0.05$]; household waste generation and socio – economic stratum [$X^2 (6, N = 207) = 0.006, p < 0.05$]. Hence, households in the Lagos Central District, in low economic stratum are less likely to generate plastic as household solid waste than those of Lagos East and West Districts in the high economic stratum.

Plastic Waste Disposal

The responses on the highest plastic waste comingling and disposal with other waste types was observed in tertiary education, on the 30 – 39 years, by the male gender, heads of households, in a flat system, in Lagos East and West Districts and, in high – income area. Household plastic waste disposal increased with increasing educational, but decreased with increasing age, gender of respondents, household position, increasing size of nature of dwelling, and across residential areas. While household plastic waste disposal was irregular with increasing socio – economic status. Household disposal of plastic waste significantly decreased with increasing age ($p < 0.05$). While household disposal of plastic waste was significantly irregular with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; Plastic waste disposal and increasing age [$X^2 (24, N = 215) = 0.46, p < 0.05$]; household plastic waste disposal and socio – economic status [$X^2 (8, N = 215) = 0.017, p < 0.05$]. Hence, the older age group households in low economic stratum are less likely to comingling and dispose plastic waste than those of the younger age groups in high economic stratum (H1).

Sight of Plastic Material

The responses on the household highest ever seen plastic material was observed in tertiary education, on the 30 – 39 years and 40 – 49 years age groups, by the male gender, heads of households, in a flat system, in Lagos East District, in high – income area. Ever seen plastic material increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While ever seen plastic material was irregular across residential areas and with increasing socio – economic status. Ever seen plastic material was significantly irregular across residential areas ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; household ever seen plastic material and residential area [$X^2 (6, N = 216) = 0.000, p < 0.05$]; household ever seen plastic material and socio – economic status [$X^2 (6, N = 219) = 0.007, p < 0.05$]. Hence, households from Lagos West and Central District, in lowly economic stratum are less likely to ever have seen plastic material than those of Lagos East District, in the highly economic stratum.

Ever Used Plastic Material

The responses on the highest level of household ever used plastic material was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in a flat system, in Lagos East District, in a high – economic area. Ever used plastic material increased with increasing educational level and increasing socio – economic status. While ever used plastic material decreased with increasing age, gender of respondents, household position, and increasing size of nature of dwelling. Also, ever used plastic material was irregular across residential areas. Household ever used plastic material significantly increased with increasing level of education ($p < 0.05$) and increasing socio – economic status ($p < 0.05$), but significantly decreased with household position ($p < 0.05$). However, ever used plastic material was significantly irregular across residential areas.

A chi – square test of independence was significant for the following relationships; ever use plastic material and increasing level of education [X^2 (10, N = 219) = 0.005, $p < 0.05$]; householders' ever used plastic material and household position [X^2 (3, N = 218) = 0.000, $p < 0.05$]; ever use plastic material and residential area [X^2 (4, N = 219) = 0.000, $p < 0.05$]; ever used plastic and socio – economic status [X^2 (4, N = 219) = 0.000, $p < 0.05$]. Hence, low educated head of households, from Lagos Central District in low economic stratum are less likely to have ever used plastic material than the highly educated other members of household, from Lagos East and West District in the high economic stratum.

Frequency of Use of Plastic Material

The responses indicating the highest frequency of plastic use was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in a flat system, in Lagos East and Central Districts, in low – income and high – income areas. Frequency of household plastic use increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While frequency of plastic material use was irregular with residential area and with increasing socio – economic status. Frequency of plastic use was significantly irregular with residential area ($p < 0.05$) and increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; frequency of plastic use and residential area [X^2 (10, N = 219) = 0.000, $p < 0.05$]; frequency of plastic use and socio – economic status [X^2 (10, N = 219) = 0.000, $p < 0.05$]. Hence, households in Lagos West District, in a middle – economic stratum are less likely to frequently use plastic than those of Lagos East and Central Districts in the other socio – economic strata.

Frequency of Plastic Purchase

The responses indicating the highest household's frequency of plastic purchase was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households,

in a flat system, in Lagos East and Central Districts, in a middle – income area. Frequency of plastic purchase increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and nature of dwelling unit. Frequency of plastic purchase was irregular across the residential areas and with increasing socio – economic status. Frequency of plastic purchase significantly decreased with increasing age ($p < 0.05$). While frequency of plastic purchase was significantly irregular with residential area ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationship; frequency of plastic purchase and increasing age [$\chi^2 (30, N = 219) = 0.003, p < 0.05$]; plastic purchase and residential area [$\chi^2 (10, N = 219) = 0.000, p < 0.05$]; frequency of plastic purchase and socio – economic strata [$\chi^2 (10, N = 219) = 0.000, p < 0.05$]. Hence, households of older age groups, in Lagos West District, in low economic stratum are less likely to frequently purchase plastic material than those younger groups from Lagos East and Central Districts, in high economic stratum.

Notice of Plastic Littering

The responses indicating the highest notice of plastic waste littering was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in a flat system, in the Lagos East and Central Districts, in low – income area. Notice of plastic littering increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While notice of plastic waste littering was irregular with residential nature and increasing socio – economic status. Notice of plastic waste littering significantly increased with increasing level of education ($p < 0.05$).

A chi test of independence was significant for the relationship between notice of plastic waste littering and socio – economic strata [$\chi^2 (15, N = 219) = 0.001, p < 0.05$]. The low educated

respondents were less likely to notice plastic waste littering than the high educated ones. There is a significant positive correlation between (N=218) notice of plastic littering and household position ($k = 0.036, p < 0.05$).

Where Plastic Waste Littering is noticed

The responses on the highest level of where plastic littering is noticed was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in a flat system, in Lagos East District, in a high – income area. Where plastic littering was noticed increased with increasing level of education and increasing socio – economic status. While where plastic waste littering is noticed decreased with increasing age, gender of respondents, household position, and increasing size of nature of dwelling unit. Also, where plastic littering is noticed was irregular with residential area. Where plastic waste littering is noticed significantly increased with increasing level of education ($p < 0.05$) and increasing socio – economic status ($p < 0.05$). While where plastic waste littering is noticed decreased with household position ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; where plastic waste littering is noticed and level of education [$X^2 (30, N = 219) = 0.016, p < 0.05$]; where plastic waste littering is noticed and household position [$X^2 (1, N = 218) = 0.048, p < 0.05$]; where plastic waste littering is noticed and socio – economic stratum [$X^2 (12, N = 219) = 0.012, p < 0.05$]. Hence, the low educated, heads of households, in low economic stratum are less likely to have noticed plastic waste littering at market/plazas than those high educated, other members of the household in high economic stratum.

Plastic Littering is Good

The responses on the highest level of assertion that plastic littering is not good was observed in tertiary education, on the 30 – 39 years, by the male gender, heads of households, in flat system, in the Lagos East District, in a high – income area. Plastic waste littering is not good

increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, increasing nature of dwelling. While the claim that plastic littering is not good was irregular with residential area and increasing socio – economic status. Agreement that plastic waste littering is not good significantly increased with increasing level of education ($p < 0.05$), but decreased with increasing nature of dwelling ($p < 0.05$). While the claim that the plastic waste littering is not good was significantly irregular with residential area ($p < 0.05$) and increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; between agreeing that the littering is not good and level of education [$\chi^2 (15, N = 218) = 0.00, p < 0.05$]; plastic littering is not good and residential area [$\chi^2 (6, N = 218) = 0.010, p < 0.05$]; littering is not good and socio – economic stratum [$\chi^2 (6, N = 218) = 0.026, p < 0.05$]. The low educated households, in Lagos Central District, in middle – income stratum are less likely to agree that littering is not good than those highly educated, Lagos East District in the high economic stratum. Meanwhile, there is a significant positive correlation ($N=218$) between condemnation of the plastic waste littering and increasing nature of dwelling unit ($\tau = 0.032, p < 0.05$) as hypothesized in H2.

Problems of Plastic Waste Mismanagement

The responses on the highest level of agreement to household waste mismanagement problems was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in a flat system, in Lagos East Districts, in a high – income area. Problems associated with plastic mismanagement increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, increasing nature of dwelling, and residential area. While problematic issues associated with plastic mismanagement was irregular with increasing socio – economic status. Problems associated with plastic waste mismanagement increased significantly with increasing educational level

($p < 0.05$). While Problems associated with plastic waste mismanagement decreased significantly with household position ($p < 0.05$) and increasing nature of dwelling ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; problem issues associated with plastic waste mismanagement and level of education [$X^2 (10, N = 219) = 0.001, p < 0.05$]; problematic issues associated with plastic waste mismanagement and household position [$X^2 (3, N = 218) = 0.000, p < 0.05$]; problematic issues associated with plastic waste mismanagement and nature of dwelling unit [$X^2 (10, N = 219) = 0.000, p < 0.05$]. Hence, the lowly educated, other members of the households in low housing unit are less likely not to acknowledge that there are issues associated with plastic waste mismanagement than those of the highly educated, heads of households, in high dwelling units.

Issue Associated with Plastic Waste Mismanagement

The responses on the highest level of issues associated with plastic waste mismanagement was observed in tertiary education, on the 18 – 29 and 30 – 39 years age groups, by the male gender, heads of households, in a flat system, in Lagos East Districts, in a high – income area. Acknowledgment of issues associated with plastic waste mismanagement increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While acknowledgment of issues associated with plastic waste mismanagement was irregular with residential area, and increasing socio – economic status. The acknowledgement of issues associated with plastic waste mismanagement significantly increased with increasing level of education ($p < 0.05$). While acknowledgement of issues associated with plastic waste management was significantly irregular with residential area ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$). A chi – square test of independence was significant for the following relationships; issue associated with plastic waste mismanagement and level of education [$X^2 (55, N = 219) = 0.000, p < 0.05$]; issues associated with plastic waste mismanagement and residential area [$X^2 (22, N$

= 219) = 0.000, $p < 0.05$]; issue associated with plastic waste mismanagement and socio – economic stratum [X^2 (22, N = 219) = 0.001, $p < 0.05$]. Hence, low educated households, in Lagos Central District, in high economic stratum are less likely to identify issues associated with plastic waste mismanagement than those high educated, in Lagos East and West District, in low economic stratum.

Result on Degradability of Plastic Waste

The responses on the highest level of identification with the non – degradability of plastic waste was observed in tertiary education, on the 30 – 39 years age group, by male gender, heads of households, in flat system, in Lagos East District, in a high – income area. Acknowledgement of plastic waste non – degradability increased with increasing educational level, increasing nature of dwelling, but decreased with increasing age, gender of respondents, and household position. While acknowledgement of plastic waste non – degradability was irregular with residential area and increasing socio – economic status. Acknowledgement of plastic waste non – degradability significantly increased with increasing educational level ($p < 0.05$) and increasing socio – economic status ($p < 0.05$). While acknowledgement of plastic waste non – degradability was significantly irregular across residential area.

A chi – square test of independence was significant for the following relationships; degradability of plastic waste and educational level [X^2 (15, N = 217) = 0.000, $p < 0.05$]; degradability of plastic waste and residential area [X^2 (6, N = 217) = 0.000, $p < 0.05$]; degradability of plastic and socio – economic stratum [X^2 (6, N = 219) = 0.000, $p < 0.05$]. Hence, the low educated households, in Lagos Central Districts, in low economic stratum are less likely to acknowledge plastic waste non – degradability than those high educated households, in Lagos East District, in high economic stratum.

Need to better manage Plastic Waste

The highest level of responses on the need to better manage plastic waste was observed in the

tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in a flat system, in Lagos East District, in low – income area. Need to better manage plastic waste increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While need to better manage plastic waste was irregular with residential area and increasing socio – economic status. Need to better manage plastic waste significantly increased with increasing educational level ($p < 0.05$). Need to better manage plastic waste was however significantly irregular with residential area ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; need to better manage plastic waste and educational status [$\chi^2 (20, N = 218) = 0.000, p < 0.05$]; need to better manage plastic waste and residential area [$\chi^2 (1, N = 218) = 0.033, p < 0.05$]. Hence, the low educated households, in Lagos Central District are less likely to better manage plastic waste than those of the high educated households, in Lagos East District (Hypothesis H4). Previous studies showed that household wealth and education level were significant determinants of unsafe plastic waste disposal (Kombiok, et al., 2021) and Osunji, 2021 asserted that the more educated households exhibit more positive pro – environmental behaviour with regards to environmental protection as corroborated by Khuc et al., 2023.

Plastic Waste has Economic Value

The responses on the highest level of acknowledgement, that plastic waste has economic value was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in a flat system, in Lagos East District, in low – income area. Plastic waste has economic value increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, increasing nature of dwelling, and residential area. While plastic waste has economic value was irregular with increasing socio – economic status. Plastic waste has economic value significantly increased with educational status ($p < 0.05$).

While plastic waste has economic value significantly decreased with residential area ($p < 0.05$). A chi – square test of independence was significant for the following relationships; plastic waste has economic value and educational status [$X^2 (20, N = 219) = 0.001, p < 0.05$]; plastic waste has economic value and residential area [$X^2 (8, N = 218) = 0.015, p < 0.05$]. Hence, the low educated households, in Lagos Central District are less likely to acknowledge that plastic waste has economic value than those high educated households in Lagos East District (H4 & H5).

Plastic Waste Reuse

The responses indicating the highest level of plastic waste reuse was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in flat system, in Lagos Central District, in low – income area. Plastic waste reuse increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While plastic waste reuse was irregular with residential area and increasing socio – economic status. Plastic waste reuse significantly decreased with household position ($p < 0.05$). Plastic waste reuse was significantly irregular with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; plastic waste reuse and household position [$X^2 (3, N = 213) = 0.000, p < 0.05$]; plastic waste reuse and socio – economic status [$X^2 (4, N = 214) = 0.019, p < 0.05$]. Hence, other members of the households, in high economic stratum are less likely to reuse plastic waste than the heads of households in low economic stratum.

Effort to Reduce Plastic Waste Generation

The responses on the highest effort to reduce plastic waste generation was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in flat system, in Lagos West District, in low – income area. Effort to reduce plastic waste generation

increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, increasing nature of dwelling, and reducing socio – economic status. While effort to reduce plastic waste generation was irregular with increasing socio – economic status. Effort to reduce plastic waste generation significantly decreased with gender of respondents ($p < 0.05$) and with socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; efforts to reduce plastic waste generation and gender of respondents [$\chi^2 (4, N = 219) = 0.026, p < 0.05$]; effort to reduce plastic waste generation and socio – economic status [$\chi^2 (8, N = 219) = 0.028, p < 0.05$]. Hence, the female respondents in low economic stratum are less likely to make effort to reduce plastic generation than the male respondents in high economic stratum.

Plastic Waste Scavenging

The responses on the highest support for plastic waste scavenging was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in flat system, in Lagos East District, in low – income area. Support for plastic waste scavenging increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, increasing nature of dwelling, and residential area. Support for plastic waste scavenging significantly decreased with gender of respondents ($p < 0.05$) and was significantly irregular with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; support for plastic waste scavenging and gender of respondents [$\chi^2 (3, N = 216) = 0.032, p < 0.05$]; support for plastic waste scavenging and socio – economic status [$\chi^2 (6, N = 216) = 0.001, p < 0.05$]. Hence, the female respondents in high economic stratum are less likely to encourage plastic waste scavenging than the male respondents in the low economic stratum.

Household Plastic Waste Separation

The responses indicating the highest household separate plastic waste was observed in tertiary

education, on the 30 – 39 years age group, by the male gender, heads of households, in flat system, in Lagos Central District, in the low – income and middle – income areas. Household separate plastic waste increased with increasing educational level and household position. While household separate plastic decreased with increasing age, gender of respondents, household position, increasing nature of dwelling, and increasing socio – economic status. Household separate plastic waste significantly increased with residential area ($p < 0.05$). A test of symmetry showed that there is a significant positive correlation ($N=219$) between household willingness to separate plastic waste and residential area ($\tau = 0.005, p < 0.05$).

Treating Separated Plastic Waste

The responses on the highest Government – approved level of treatment of separated plastic waste was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in flat system, in Lagos West District, in a middle – income stratum. Treatment of separated plastic waste increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, increasing nature of dwelling. While treatment of separated plastic waste was irregular with residential area and increasing socio – economic status. Government – approved treatment of separated plastic waste was significantly irregular with residential area ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; household treatment of separated plastic waste and residential area [$X^2 (12, N = 219) = 0.00, p < 0.05$]; household treatment of separated plastic waste and socio – economic status [$X^2 (12, N = 219) = 0.000, p < 0.05$]. Hence, Lagos East District households, in low economic stratum are less likely to treat separated plastic waste properly than those of Lagos West District, in high economic stratum.

Reasons for not separating Plastic Waste

The responses on the highest reason for not separating waste on the ground that household has only one waste receptacle was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in flat system, in Lagos West District, in high – income area. Reason for not separating plastic waste at source increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While why not separate waste was irregular with residential area and with increasing socio – economic status. Why not separate waste significantly decreased with increasing age ($p < 0.05$), but was significantly irregular with residential area ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; why not separate waste and age range [$X^2 (54, N = 219) = 0.017, p < 0.05$]; why not separate waste and residential area [$X^2 (18, N = 219) = 0.06, p < 0.05$]; why not separate waste and socio – economic status [$X^2 (18, N = 219) = 0.010, p < 0.05$]. Hence, the older age group households, in Lagos Central District, in low economic stratum are less likely not to sort waste for the fact that household has only one waste container than those younger age groups, in Lagos West District, in high economic stratum.

Willingness to Participate in Plastic Recycling

The responses on the highest household willingness to participate in plastic waste recycling was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in flat system, in Lagos East District, in a low – income area. Willingness to participate in plastic waste recycling increased with increasing educational level, but decreased with increasing age, with gender of respondents, with household position, and with increasing nature of dwelling. While willingness to participate in plastic waste recycling was irregular with residential area and with increasing socio – economic status. Willingness to participate in plastic waste recycling significantly decreased with nature of dwelling ($p < 0.05$). While

willingness to participate in plastic waste recycling was significantly irregular with residential area ($p < 0.05$) and socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; willingness to participate in plastic waste recycling and nature of dwelling [$X^2 (25, N = 219) = 0.035, p < 0.05$]; willingness to participate in plastic waste recycling and residential area [$X^2 (10, N = 219) = 0.022, p < 0.05$]; willingness to participate in plastic waste recycling and socio – economic status [$X^2 (10, N = 219) = 0.033, p < 0.05$]. Hence, households in the low nature of dwelling unit, in Lagos Central District, in low economic stratum are less likely to participate in plastic waste recycling than those in high dwelling units, in Lagos East District, in high economic stratum.

Willingness to Separate Plastic Waste at Government Directive

The responses on the highest level of willingness to participate in plastic waste separation in compliance with the Government directive was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in flat system, in Lagos East District, in a high – income area. Willingness to participate in plastic waste separation in compliance with the Government's directive increased with increasing educational level, but decreased with increasing age, gender of respondents, household position and increasing nature of dwelling. While willingness to participate in plastic waste separation in compliance with the Government's directive was irregular with residential area and increasing socio – economic status. Willingness to participate in plastic waste separation in compliance with the Government's directive significantly increased with increasing educational status ($p < 0.05$), but significantly decreased with increasing nature of dwelling ($p < 0.05$). While willingness to participate in plastic waste separation at the Government's directive was significantly irregular with residential area ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; willingness

to participate in plastic waste separation in compliance with the Government's directive and educational status [X^2 (15, N = 219) = 0.004, $p < 0.05$]; willingness to participate in plastic waste separation at Government's directive and nature of dwelling unit [X^2 (15, N = 219) = 0.003, $p < 0.05$]; willingness to participate in plastic waste separation at the Government's directive and residential area [X^2 (6, N = 219) = 0.019, $p < 0.05$]. Hence, low educated households, in low nature of dwelling unit, in Lagos Central District are less likely to be willing to participate in plastic waste separation in compliance with the Government's directive than those high educated households, in high nature of dwelling unit, in Lagos East District.

Responsibility for Sustainable Waste Management

The responses on the highest level of agreement to Government and citizens' responsibility to attain sustainable MWS management state was observed in tertiary education level, on the 30 – 39 years and 40 – 49 years age groups, by the male gender, heads of households, in flat systems, in the Lagos East District, in the low – income area. Agreement to Government and citizens' responsibility to attain sustainable MWS management increased with increasing educational level, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While agreement to Government and citizens' responsibility to attain sustainable MWS management was irregular with residential area, and increasing socio – economic status. Agreement to Government and citizens responsibility to attain sustainable MWS management significantly increased with increasing level of education ($p < 0.05$), but significantly decreased with increasing nature of dwelling ($p < 0.05$). While the agreement to Government and citizens responsibility to attain sustainable MWS management was significantly irregular with residential area ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; responsibility for sustainable MSW management and increasing nature of dwelling unit [X^2 (1,

$N = 218$) = 0.003, $p < 0.05$]; responsibility for sustainable MSW management and residential area [X^2 (6, $N = 218$) = 0.026, $p < 0.05$]; responsibility for sustainable MSW management and socio – economic status [X^2 (6, $N = 218$) = 0.025, $p < 0.05$]. Hence, household with the low nature of dwelling unit, in Lagos Central District, in high economic stratum are less likely to believe that it is the responsibility of the Government and the citizens to ensure sustainable MSW than those of high dwelling unit, in Lagos East District, in low economic stratum. Meanwhile, there is a significant positive correlation ($N=218$) between responsibility to attain sustainable MWS management and increasing level of education ($\tau = 0.02$, $p < 0.05$) as hypothesized in H1.

Willingness to Minimize Plastic Waste Mismanagement

The responses on the highest level of willingness to minimize plastic waste mismanagement was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in flat system in Lagos Central District, in high – income area. Willingness to minimize plastic waste mismanagement increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While the willingness to minimize plastic waste mismanagement was irregular with residential area and increasing socio – economic status. Willingness to minimize plastic waste mismanagement significantly increased with increasing level of education ($p < 0.05$). While the willingness to minimize plastic waste mismanagement significantly decreased with increasing age ($p < 0.05$), with gender of respondents ($p < 0.05$), and with increasing nature of dwelling ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; willingness to minimize plastic waste mismanagement and increasing level of education [X^2 (15, $N = 217$) = 0.014, $p < 0.05$]; willingness to minimize plastic waste mismanagement and increasing age [X^2 (18, $N = 217$) = 0.002, $p < 0.05$]. Hence, low educated older age groups are less likely to

be willing to minimize plastic waste mismanagement than those high educated households and the younger age group. More so, there is a significant positive correlation for the following relationships; willingness to minimize plastic waste mismanagement and gender of respondents [$\tau = 0.049$, (N=217), $p < 0.05$]; willingness to minimize plastic waste mismanagement and increasing nature of dwelling [$\tau = 0.042$, (N=217), $p < 0.05$].

Acceptance of Ban on Single Use Plastic

The responses on the highest level of acceptance for the intended ban on single – use plastic was observed in the tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in flat system, in Lagos West District, in a high – income area. Acceptance of the intended ban on single – use plastic increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While the acceptance of the intended ban on single – use plastic was irregular with residential area and increasing socio – economic status. Acceptance of the intended ban on single – use plastic significantly increased with increasing level of education ($p < 0.05$). While the acceptance of the intended ban on single – use plastic significantly decreased with increasing nature of dwelling ($p < 0.05$).

A chi – square test of independence was significant for the relationship between acceptance of ban on the single – use plastic material and nature of dwelling unit [$X^2 (15, N = 215) = 0.004$, $p < 0.05$]. Hence, the households in the low nature of dwelling unit are less likely to accept the placement of ban on single – use plastics than those in high dwelling unit. There is also a significant positive correlation (N=215) between acceptance of ban on single – use plastic and educational status ($\tau = 0.017$, $p < 0.05$).

Doing without the use of Plastic Materials

The responses on the highest level of claim of doing without the use of plastic material was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of

household, in flat system, in Lagos West District, in a high – income areas. Doing without the use of plastic material increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While doing without the use of plastic material was irregular with residential area and increasing socio – economic status. Doing without the use of plastic material was significantly irregular across residential area ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$). A chi – square test of independence was significant for the following relationships; doing without the use of plastic material and residential area [$X^2 (6, N = 218) = 0.001, p < 0.05$]; doing without plastic material use and socio – economic status [$X^2 (6, N = 218) = 0.042, p < 0.05$]. Hence, Lagos Central District households, in low economic stratum are less likely do without plastic use than those in Lagos West District, in high economic strata.

Household Disposal of Solid Waste

The responses on the highest level of disposal of MSW through Government – approved PSPs was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in flat systems in the Lagos Central District, in a high – income area. Disposal of MSW through Government – approved PSPs increased with increasing level of education, residential area, and increasing socio – economic status. While disposal of MSW through Government – approved PSPs decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. Household disposal of waste through the Government – approved PSP significantly decreased with increasing nature of dwelling ($p < 0.05$). While household disposal of waste through the Government – approved PSP significantly increased across the residential areas ($p < 0.05$) and socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; household disposal of municipal solid waste and nature of dwelling unit [$X^2 (25, N = 219) = 0.009, p <$

0.05]; household disposal of MSW and residential area [X^2 (10, N = 219) = 0.021, $p < 0.05$]; household municipal solid waste disposal and socio – economic status [X^2 (10, N = 219) = 0.000, $p < 0.05$]. Hence, households in the low nature of dwelling unit, in Lagos East District, in low economic stratum are less likely to properly dispose municipal solid waste than those of high dwelling unit, in Lagos Central District, in high economic stratum.

Household Payment of Waste Management Services

The responses that indicated the highest level of household payment of waste service charges was observed in the tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in flat system, in Lagos Central District, in a high – income area. Household payment of waste service charges increased with increasing educational level, residential area, and increasing socio – economic status. While household payment of waste service charges decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. Household payment for waste service charges significantly decreased with the increasing nature of dwelling ($p < 0.05$). While household payment for waste service charges significantly increased with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; household payment for waste management services and nature of dwelling unit [X^2 (15, N = 219) = 0.000, $p < 0.05$]; household payment for waste management services and socio – economic status [X^2 (6, N = 219) = 0.000, $p < 0.05$]. Hence, households in the low nature of dwelling units, in low economic stratum are less likely to pay for waste disposal services than those in high dwelling unit, in higher economic strata (H3).

Household Waste Continue Payment for Waste Services

The responses on the highest level of household continue payment of waste service charges was observed in tertiary education, on the 30 – 39 years and 40 – 49 years age groups, by the male gender, in flat system, in Lagos West District, in high – income area. Household continue

payment for waste service charges increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While household continued payment for waste service charges was irregular with residential area and with increasing socio – economic status. Household willingness to continue payment for waste service charges significantly increased with increasing nature of dwelling ($p < 0.05$). While household continue payment for waste service charges was significantly irregular with residential area ($p < 0.05$) and with increasing socio – economic status ($p < 0.05$). A chi – square test of independence was significant for the following relationships; household continue payment for waste services and nature of dwelling unit [$\chi^2 (10, N = 219) = 0.001, p < 0.05$]; household continue payment for waste services and residential area [$\chi^2 (4, N = 219) = 0.024, p < 0.05$]; household continue payment for waste services and socio – economic stratum [$\chi^2 (4, N = 219) = 0.038, p < 0.05$]. Hence, households in the low nature of dwelling unit, in Lagos West District, in low economic stratum are less likely to continue the payment of waste services than those in high dwelling unit, in Lagos Central District, in high economic stratum (H3).

Hearing about PAKAM App

The responses on the highest level of respondents that have heard of the PAKAM App was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of households, in flat systems, in Lagos East District, in middle – income area. Household heard of the PAKAM App increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. While household ever heard of the PAKAM App was irregular with residential area and increasing socio – economic status. Household ever heard of the PAKAM App significantly increased with increasing educational status ($p < 0.05$), but decreased with increasing nature of dwelling ($p < 0.05$). Household ever heard of the PAKAM App was significantly irregular with residential

area ($p < 0.05$), and with increasing socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; household heard of the PAKAM App and nature of dwelling unit [$X^2 (1, N = 218) = 0.031, p < 0.05$]; household heard of PAKAM App and residential area [$X^2 (6, N = 218) = 0.005, p < 0.05$]; household ever heard of PAKAM App and socio – economic status [$X^2 (6, N = 218) = 0.005, p < 0.05$]. Hence, households in the low nature of dwelling unit, in Lagos West and Central Districts, in low economic stratum, are less likely to have heard of PAKAM App than those in high dwelling unit, in Lagos East District, in high economic stratum. There is a significant positive correlation ($N=218$) between ever heard of PAKAM App and educational level ($\tau = 0.031, p < 0.05$).

Use of PAKAM App

The responses on the highest level of households that ever used the PAKAM App was observed in tertiary education, on the 40 – 49 years age group, by the male gender, heads of households, in flat system, in Lagos West District, in a middle – income area. Households that ever used the PAKAM App increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and increasing size of the nature of dwelling. While ever used the PAKAM App response was irregular with residential area and increasing socio – economic status. Households that ever used the PAKAM App response significantly decreased with increasing age ($p < 0.05$). While households that ever used the PAKAM App was significantly irregular with household position ($p < 0.05$) and with socio – economic status ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; ever used the PAKAM App and household position [$X^2 (3, N = 124) = 0.000, p < 0.05$]; ever used the PAKAM App and socio – economic status [$X^2 (4, N = 125) = 0.031, p < 0.05$]. Hence, other members of the household, in low economic stratum are less likely to have ever used the

PAKAM App than those heads of households in the high economic stratum. However, there is a significant negative correlation ($N=125$) between ever used the PAKAM App and increasing age ($\tau = 0.04, p < 0.05$).

Why not use PAKAM App

The highest response on why not use the PAKAM App for the lack of knowledge on how to use it was observed in tertiary education, on the 30 – 39 years age group, by the male gender, heads of household, in flat system, in Lagos West District, in low – income area. The responses on the why not use the PAKAM App increased with increasing level of education, but decreased with increasing age, gender of respondents, household position, and increasing nature of dwelling. The responses on the why not use the PAKAM App was irregular with residential area and with increasing socio – economic status. Why not use PAKAM App significantly increased with increasing level of education ($p < 0.05$), but decreased with household position ($p < 0.05$).

A chi – square test of independence was significant for the following relationships; why not use the PAKAM App and household position [$X^2 (3, N = 124) = 0.000, p < 0.05$]; why not use the PAKAM App and residential area [$X^2 (14, N = 218) = 0.001, p < 0.05$]; why not use the PAKAM App and socio – economic status [$X^2 (14, N = 219) = 0.016, p < 0.05$]. Hence, other members of the households, in Lagos Central District, in the high economic stratum are less likely not to have used the PAKAM App for the lack of knowledge on how to use it than the heads of households, in Lagos West District, in low economic stratum.

Interview Results

The interview type included one – on – one or physical presence interview and Focus Group Discussions. This involved three (3) major categories of interviewees which were Lagos State Government Officials (responsible for waste policy formulation and management), plastic scavengers/accumulators/merchants, and recovered plastic waste off – takers for

manufacturing. Following the reporting pattern that allows the report writing to be dictated by the research questions, the answers to the research questions were as follows:

How Households contribute to aiding or hindering the Transition

The answers drawn from the second RQ2 which is ‘how have the households managed municipal solid waste that could either have contributed to hindering or aiding the transitioning process to sustainable solid waste management in Lagos, Nigeria?’ are as highlighted below.

In one of the face – to – face individual interviews, one respondent was quick to say that ‘charity they say begins at home’ and as such, most of the attitudes that individuals usually exhibit outside the home started from their home or is related to their upbringing. He substantiated that an individual who is well brought up or in whose household exists strict and good solid waste management practices will hardly get involved in throwing away municipal solid waste or plastic waste in public places. But that, in situations where either within the household or around their dwelling premises, if waste, no matter how small or big is thrown away as all deem fit, then, such individual(s) will not be bothered to do the same in public. In line with the foregoing, he threw forward a seeming rhetoric question: ‘what is expected of a child or ward that the parent(s) will ask to go and dump waste at the road median(s) or open spaces at night because they don’t want to pay for waste service charges. Answering the question himself, he claimed that such a child is likely to grow up abusing the environment. The salient point here is that what the family unit or household practices at home is what the individual householder may end up displaying in the public. In a way of surmising, the respondent stated that the problem with solid waste management in Lagos is more of human factors than any other factor: an opinion shared by most respondents.

The State Government has been clamouring for proper use of standard waste receptacles at all households since over a decade ago (though the Government has been accused of not doing enough on her own part to make this demand a reality), yet the survey conducted

showed that 7% of respondents indicated that they do not store waste temporarily within the dwelling unit and do not have any form of waste receptacle(s). About 35.7% of respondents use waste bags for temporary storage of waste while about 50.0% use bins or baskets. LAWMA advocates for each household to have a minimum of 2 plastic waste receptacles – wheeler bin, 240 litres with cover (see Figure 4.40 and 4.41), unfortunately, compliance in this regard are usually visible within an organized estate with strong landlord and resident associations with environmental concerns. The State Government approved waste collection frequency for residential premises (by PSPs on solid waste collection, transportation and disposal) is once in a week, amounting to four times in a month. But where the household have small waste bins or plastic baskets that might fill – up within a few days, the householders will usually find a way to dispose – off the waste illegally/fly – tipping (see Figure 4.43) and as such contribute to continuous solid waste mismanagement in the State. An FGD discussant pointed out, for one reason or the other, PSPs may fail to turn up on their regular collection date, and where the recommended size of waste receptacles are used based on volume of waste generated, it would have been possible to endure pending when the PSPs are able to show up, probably the next week. But that, this usually is not the case as it is often observed within the metropolis that unlined receptacles have waste surrounding the environment. One salient point here is that where households failed to have waste receptacles that can contain their waste, it contributes to solid waste leakages along the solid waste management value chain.

It was emphasized that before the household waste could further be processed after inhouse storage with waste separation or not, it must be collected from the generators, transported to the dumpsite/landfills or Materials Recovery Facility (MRF), recycling outfit, among others according to the existing solid waste management processes available within the community or state. In Lagos State, the collection of these wastes by PSP or illegal cart pushers is at a cost to the generators of the waste or persons that want to dispose of their generated

municipal solid waste. It was gathered that not all households feel that they should pay for solid waste carting (see Figure 4.43). For some reasons, some households will prefer to give their waste to cart pushers (illegal waste collectors that operate in some localities doing pay – as – you – go for every waste collected from household members) rather than patronizing government – approved PSPs. On the ground that the Government considers the cart pushers activities as illegal, they do not have the right or access to the approved dumpsites. Thus, they collect the waste from the households and push the cart to dump the waste in gorges, open spaces, road medians, road setbacks, among others. The dumping’ or fly – tipping is usually carried out under the cover of darkness within some part of the metropolis while some in the out skirts of the metropolis, it could be dumped at any time, and it is done with reckless abandonment. Thus, by denying the government – approved PSPs access to the collection of household’s generated waste and practicing other illegal means of solid waste disposal, the households contribute to worsening the problems of solid waste management within Lagos State.

The avoidance of payment for waste services in Lagos was said to have been compounded by the immediate past administration in an effort to implement the ‘Cleaner Lagos Initiative’ which later suffered a heavy setback as a result of policy summersault. Part of the initiative was to put most utility bills like, land use charge, waste service charge, pipe – borne water bill, among others under a bill referred to as Public Utility Bill (PUB). As such, information was disseminated to the public to stop paying for waste services separately, however while the process was being implemented, a serious setback was observed and a reversal was made and that did not augur too well with the citizens. The after effect of this is still been suffered in Lagos.

One of the ways that the Authorities in Lagos are advancing Lagos towards the Circular Economy concept of solid waste management is to advocate for waste separation at source and

increase the level of waste recycling in the State. In line with this initiative, the Lagos State Government launched the ‘adopt – a – bin’ initiative which centred on ensuring that every household has a standard waste bin.

Figure 4.40

The LAWMA’s Recommended Waste Bin for Households in Lagos



Note. Adapted from *About us. Lagos Waste Management Authority, LAWMA, 2022;* <http://buylawmabin.com/>

However, many households are decrying the initiative as the Authority intends to enforce the initiative on the people who are already claiming that they can’t afford to purchase a wheeler bin talk more of having to purchase two; the green bin for general waste, while the blue bin is meant for recyclables (Figure 4.40 and Figure 4.41).

Figure 4.41

Litres Waste Receptacles, Lekki, Lagos



Note. Self-taken

Some houses purchased the general waste receptacles as recommended by LAWMA but see no reason to buy receptacles for recyclables, at least, for now (Figure 4.42)

Figure 4.42

The LAWMA – Recommended 240 Litres Waste Receptacles as Displaced in front of a block of Six Flats



Note. Self-taken photographs

In one of the Focus Group Discussions, it was mentioned that less than 10.0% of households in Lagos sort or separate waste in their households and it was emphasized that difficulties/refusal by most households to sort waste at source is a major hindrance towards the drive to achieve some level of sustainable solid waste management in the State.

Plans are already initiated to place a ban on single – use plastics (disposable food packs and wrappers, straw, plastic spoon, cellophanes, disposable plastic material, sweet wrapper, portable water sachet, among others) and the willingness to comply to such ban was tested in the survey. The result showed 61.1% claimed that they are willing to comply should the Government declare a ban on single – use plastic, while 25.8% indicated their unwillingness to comply with such directives. The remaining 13.1% of the respondents were as at the time of interview indifferent, not knowing if they will comply or not to any of such move in the State

(see Figure 4.32). This kind of resistance to Government planned policies (see unwillingness in Figure 4.43) even before arrival can and does contribute to delay in attaining the sought sustainable solid waste management practices in Lagos. Outside being willing or not willing to comply to the proposed ban on single – use plastic, the respondents were also asked to indicate if they think it is possible to cope without single – use plastic. The finding showed 40.7% believe it is possible to live life without the use of single – use plastics, while 46.3% claimed that they cannot cope without using single – use plastic materials. About 13.0% of the respondents were indifferent in this regard (see Figure 4.33). The FGD discussants were divided on whether the Government should go ahead to ban single – plastic use in the State. It was however concluded that, where the ban is considered inevitable, then the ban or banning should be carried in phases.

On the brighter side, some households in some well – organized estates could be said to have contributed positively to enhancing the drive towards a more sustainable solid waste management in the State. It was pointed out that such estates like Gbagada Housing Estate, Phase II made it mandatory that the households sort their waste at source and households have their standard Government – approved bins for regular food and related wastes while recyclables are deposited in separate bins. According to the respondent, these households' practices have become examples to other households to follow. That to further help the situation, LAWMA has constructed recycling banks for plastic waste, paper and bottles in the neighbourhoods. However, it is worth mentioning that in these estates where waste separation is practiced still have a lot to do to totally achieve the purposes of waste separation at source. The reason behind this statement is for the fact that most separated plastic materials are PET bottles and vails while lightweight plastic waste, especially the plastics used as product wrappers, nylon bags, shower caps, among others are comingled with food or other kitchen waste.

A LAWMA respondent enlightened the group on PAKAM App initiative and pointed out that some households have activated their app and have registered with the Authority to participate in the recycling initiative of the State. That in so doing, the involved household are contributing positively towards the attainment of sustainable solid waste management within the State and they should be encouraged to do more. In the same vein, the FGD discussants were reminded to bear it in mind that the re – use of material within the household started by householders. Further emphasis pointed out that even the skeletal recovery of waste materials like plastics, paper, iron, among others were started by individuals who wanted to make a living by recovering thrown – away materials to sell them and generate some funds. Though the argument ensued on this matter as one discussant claimed the action of the householders in this matter was not intended to promote sustainable solid waste management but to just make ends meet. But after a few presentations of views, it was agreed that, just the way some households who in attempt to eke out a living contributes to the extant environment problems, so also it is with those who scavenge waste materials for a living, and in the process may contribute towards plastic waste sustainability management in the State.

It was however pointed out by FGD discussants and individual interviewees that the plastic waste mismanaged situation and the attendant problems in the study area should not be wholly placed on the households. The respondents claimed that the approaches applied by the waste regulatory bodies does not encourage the households to fully carry out the supposed roles in pushing the plastic waste management sustainability drive in the right direction. It was emphasized that it is not just enough for the government regulatory body to just put – up laws for the households to adhere to willy – nilly without winning them over to buy – in to the program. It was advised that the role of the households in the general municipal solid waste management in Lagos State should not be limited to the role of service recipient. But their roles should be considered on a broader general dimension of being the major generator of municipal

solid waste, first primary handlers of waste at the downstream level, deliverers of waste to the upstream level, as a very important stakeholder in finding solution to the existing problems, as financial contributor by way of paying for waste services to the PSPs in the waste management business and as custodians of their local communities to monitor the environment and the activities of the PSPs, among others (cf. Solomon, 2011).

On the issue of whose responsibility lies ensuring that sustainable management of plastic waste was attained in the State, it was surmised that it is the responsibility of all the citizens of Lagos. This is also agreed to in the survey strand. However, the discussion pointed out that, most citizens that are in power (government) or the decision makers are wealthy people, who often live in areas where plastic waste mismanagement is not very visible, if it does exist. That this was not as a result of Government effort but because of the governance efforts by estate executives. As such, it was argued that the responsibility of good sanitation and sound management of MSW and hence plastic waste should be more on the householders and individual communities, since they are closer to where the wastes are indiscriminately dumped.

Making Households play Sustainability Management Roles to aid the Transition

RQ3 was framed thus, ‘how can the households be integrated in the value chain of solid waste management to play some sustainability management roles that could aid transitioning to sustainable plastic waste management in the study area’?

The summation of one salient point that was reiterated over – and – over in this regard is that no matter how good a municipal solid waste management policy/programme may seem, once the generators of the municipal solid waste refuses to participate in the programme implementations, the policy/programme is destined to die on arrival. The households being the major generators of municipal solid waste and also the first handlers of waste have very important roles to play in aiding to the transitioning to sustainable plastic waste management

in Lagos. Therefore, all efforts must be put in place to ensure that they are convinced to participate in the programme willingly. The participation of the household in sustainable plastic waste management programme of the State should not be limited to only the implementation stages as it is prevalent in the study region. The households being a major stakeholder in the value chain of solid/plastic waste management needed to be engaged in the management plans/programmes from the onset. The respondents were of the opinion that the householders needed to be made to take the programme as their own since they are major stakeholders, and that this will give them a sense of belonging. The household should be involved right from the planning stages through to implementation.

In the course of planning, the anticipated sustainability roles of the households should be clearly set out, giving them an opportunity to debate or argue out their points or views on the matters arising. Once that is achieved, then the participants, whether the Community Development Committee (CDC), Community Development Association (CDA), Landlord Associations, amongst other associations within communities will be made to disseminate the information based on the agreements reached at the stakeholders' meetings. This, should be followed by aggressive re – orientation on attitudinal change towards solid/plastic waste management from in – house to outside the house, the community, and the general environment. The advocacy should be massively carried out with the intention of inculcating sustainable solid waste management practices in – house.

Government on their part must shift from command – and – control system administration to Governance to make the household have some trust on Government. This will motivate the householders to put in more effort to support the government initiative within the metropolis and the State in general. The outlined household's sustainability management roles in transitioning to sustainable plastic waste management in Lagos metropolis are:

To participate in the policy formulations, planning stage, implementation, and monitoring of waste management practices within the communities.

Educate householders of the responsibilities of the waste generators as embedded in the harmonized Lagos State Environmental Law of 2007.

Inform the Authorities on the best possible practices that the community could play that may be context specific with the community.

Discuss with authorities responsible for waste and environmental management on the major roles of the identified stakeholders along the value chain of solid waste management.

Relinquish unsustainable solid waste management practices and embrace the globally acceptable sustainable management roles as may have been reached after stakeholders' consultation fora.

To initiate in – house globally acceptable sustainable solid waste management practices within the household and around the dwelling premises for a start.

Properly containerize household generated municipal waste using government – approved waste receptacles based on waste types.

Accept and practice in – house waste sorting.

Educate the householders on the accepted sustainable management roles arising from the stakeholder's agreement.

Minimize the purchase of plastic materials and some unnecessary use of plastic material to cut down on the rate of plastic waste generation.

Use alternative materials that are more recyclable or renewable materials than plastic and are less polluting to the environment to replace plastic material.

If plastic materials must be used, then they should use a more recyclable plastic material.

Practice plastic re – use at household and individual levels.

Monitor the activities of householders with respect to solid waste management practices in the household and within the dwelling premises.

Hand over the already well – containerized waste to only authorized service providers.

Householders' participation in community policing to deter recalcitrant indiscriminate waste dumpers.

Educate the householders on the increasing value of sorted plastics waste which could be used to offset part or the entire waste service tariffs.

Adoptable Strategies to manage Plastic Waste Mismanagement

RQ 4: Which strategies have been successfully applied for some other megacities/countries of near characteristics with Lagos in the management of plastic waste?

Excerpt from discussions and interviews pointed out some facts concerning recommended solid waste management approaches that is acclaimed to be the best for developing nations like Nigeria. The recommended approach is Integrated Solid Waste Management Approach (ISWMA) and some of the tenets of ISWMA is sustainable production and consumption. It was mentioned that, since the introduction of plastic material to the Nigerian market, its production has been on the increase and the consumption as well. Therefore, once the will is developed to strategically manage the production of plastic waste, then a policy reformulation on plastic production, consumption, and the sustainable management of the arising waste must be embraced. The formulated policy for plastic consumption and generation of waste must put in place some mitigating strategies that will help reduce its generation, encourage plastic reuses, recycling, the possible conversion of waste to energy, control of plastic importation, putting on restrictions on some plastic types among others (cf. Tsai, 2022).

Rwanda was mentioned as one of the African countries in the recent time to have achieved some level of improvement in its management of plastic waste. She was said to have

achieved this feat by banning the use of plastic bags and restricted the importation of some types of plastics to the nation. The placement of the ban on such plastics were followed with rigorous enforcements, which cumulated into gross reduction of plastic importation and use. In this regard, the adopted law prohibited the manufacturing of single – use plastic in the nation, hence, a ban on single – use plastic sales and use (cf. Behuria, 2021). Sequel to this ban and restrictions, it was claimed that, the use of those affected polymers has been at minimum level over the last decades. Despite the ban, Rwanda is said to have experienced an increase in her yearly Gross Domestic Product (GDP) of approximately between 4.7 to 8.9% and an increase in her per capita GDP (Babayemi et al., 2019). These achievements in Rwanda have gone further to prove that enacting the right policies in a country can help to significantly manage plastic waste problems without hampering the industrial growth and economic development of a nation. Zanzibar Island in Tanzania has also put a ban in the use of plastic bags and non – compliance to that directive is said to attract a fine of about \$44 United States Dollars or the offenders are sentenced to six months imprisonment. Kenya, on her part has banned the use of plastic bags, bottles, cutleries, among others in 2020 at all her National Parks. In the same vein, an outright ban on the use of plastic bags nation – wide was also implemented and it is claimed that, the move has significantly promoted her environmental stewardship worldwide. Today, Kenya is being spoken of as one of the emerging leaders in the fight against plastic pollution in Africa. The nation was said to have enormously invested in policies and enforcement to reach the level of recognition (Griffin & Karasik, 2022; Opondo, 2020; Njuguna, 2018).

However, South Africa is said to have adopted the tax approach as a fashioned – out strategy in the reduction of plastic use and subsequent plastic waste generation and management. It was stated that instead of outrightly banning the use of plastic bags like it was done in Zanzibar Island (Tanzania) or in Kenya, the South African Government was said to have put a tax of 3c (cents) per plastic bag in 2003 (cf. Lange, 2015). The tax is also said to

have increased to 12c per plastic bag as at 2018 and the billions of Rands arising from the tax could be used to improve infrastructure along the solid waste management chain. The levying initiative has also assisted in discouraging most inhabitants from the use of plastic bags and hence reduce the plastic bag waste generation.

Vallabh et al. (2022) reported that the South African Waste Act as amended in 2014 is the provision for standard, norm, and regulation in the management of waste across the different spheres of government. This, accordingly is in line with section 24 of the 1996 Constitution of the Republic of South Africa to protect its citizens' environment in accordance to their right to live in an environment that is not damaging to their health as well as their wellbeing. In the light of partly fulfilling her responsibility with respect to plastic pollution, the government initiated the Extended Producer Responsibility scheme. One of the products in the scheme is plastic material packaging which is geared towards ensuring that the producers of all listed products make necessary arrangements, investment that will lead to the collection of the remaining of their products after use. This arrangement for the post – consumer stage of their products must specify procedures for recycling, reuse, recovery, processes, and disposal of their products.

It was mentioned that the Nigeria's National Policy on Solid Wastes Management mentioned on broader basis, the actions needed by the States and the Local Government Areas (LGAs) to implement in order to pursue sustainable solid waste management in their respective communities/states. The National Policy on Solid Waste Management is said to be guided by a set of principles that needed to be upheld at all levels of development and execution, hence, solid waste management in Nigeria shall be carried out following the key principles as stipulated. A search into the National Policy on Solid Waste Management (FGN, 2020) showed that some of the inherent principles are related to duty of care, proximity principles and self-sufficiency, polluter pay principle, extended producer responsibility principle, the

precautionary principle, sustainable development concepts, separation at source, life cycle principle or cradle to grave, affordability, accessibility, global citizenship, community participation, stakeholder collaboration or cooperative governance (cf. Figure 4.43).

It was emphasized that any state/community that wants to truly transit to sustainable solid waste management could expand on the policy with targeted specific waste types tailored to suite the state/community context.

How the Identified Strategies (RQ4) could be Adopted and Adapted

How can some the identified strategies (in RQ4) be adopted and adapted to suit the Lagos/Nigeria context?

Environmental Legislation specifically instituted to tackle problems associated with plastic waste is non – existent in Nigeria. By the provision of the Constitution of the Federal Republic of Nigeria (Section 20) of the 1999 Constitution, environmental management and protection is on the concurrent list. This gives the Federal Government and the Regional or State Government to legislate on such matters. On the side of the Federal Government, several environmental protections – related legislations and policies have been put to law as declared, as may be related to environmental protection and solid waste management. Some of these are the National Policy on Environment, the National Policy on Solid Waste Management, the National Environmental Regulations of 2011 (where S.I, No.17 generally mention Domestic and Industrial Plastic, Rubber and Foam Sectors). It was also mentioned that in recognition to the fact that something drastic must be done to curtail the continued increase in the amount of generated waste and the subsequent problems associated with its mismanagement, the Federal Ministry of Nigeria drafted a plastic management policy in October, 2018; the draft policy till date is not yet adopted for implementation. In a near similar vein, the Federal House of Representatives in May 2019 passed a billed tagged ‘plastic bag prohibition bill’; however, till date, nothing in this direction has been implemented. The above efforts as mentioned among

others is an indication that even at the Federal level, the growing problems with plastic waste mismanagement is acknowledged and the need to tackle it is assented to.

Lagos State however has been trying to put up a working policy for the sustainable management of plastic waste in the state since environmental management is on the concurrent list of the Federal Constitution of Nigeria. The majority of the respondents who discussed on the possibility of borrowing from other countries' strategies to manage plastic waste, especially PET bottles and some plastic packaging materials were of the opinion that the Extended Producers Responsibility (EPR) and the plastic Deposit Return/Refund Schemes should be adopted and adapted to suit the Lagos context. As stated, EPR is a strategy that ensures that every producer that puts her products out to the public, shall be made to be partly responsible for the waste arising after the end – of – life of the products. For the DRS, it involves placing a premium on the items listed in the scheme, which are paid or deposited whenever a customer/consumer purchases such listed goods. The refund to the consumer is paid back whenever the empty plastic bottle is returned to designated collection centres as may be specified by the scheme. To establish EPR and DRS in Lagos, there is a need to first of all promulgate workable legislation as a framework for the implementation of the scheme. Since the DRS is to be adapted to suit the Lagos context, the legislation and policies needed to be instituted through evidence – based processes. The DRS system works on the premises that when a financial incentive is created for the consumers, the likelihood exists that the returning of the packaging will be more assured. By so doing, an increase in the collection of the waste material is assured, hence reduction in its mismanagement and subsequent pollution. It was stated that DRS is highly recommended for developing countries that do not yet have strong established waste management systems and has been shown to be one of the best schemes/strategies for the minimization of plastic waste leakages along the value chain of solid waste management.

Key Talking Points

From the interview manual and voice recordings transcribed, a word cloud was generated (Figure 4.43) to bring out salient points/words using online Word Clouds application (<https://classic.wordclouds.com/>). A mix of inductive and deductive coding approaches were applied.

Figure 4.43

Word Cloud Generation of Codes from Interviews



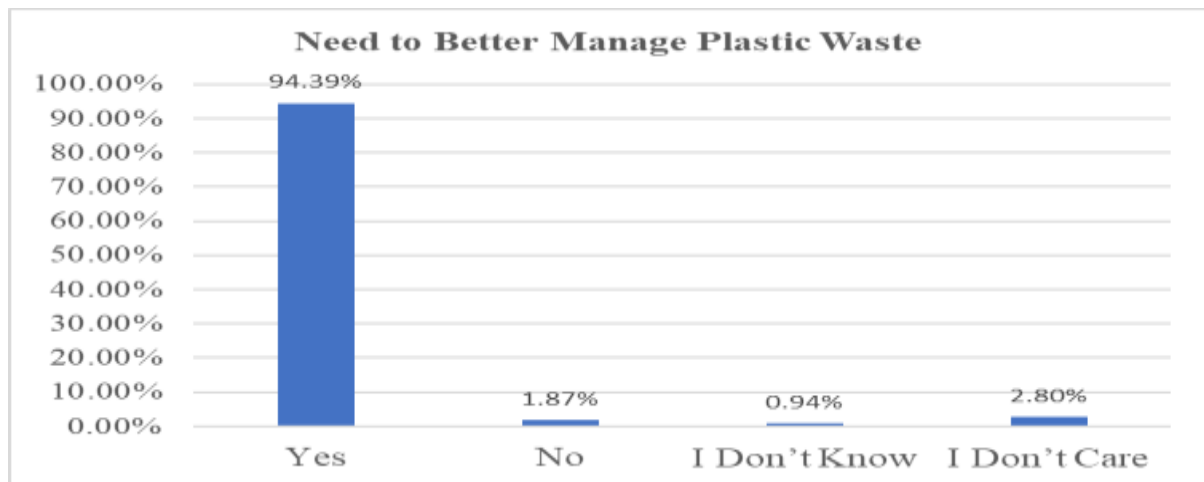
Note. Self-developed

The Word Cloud is generated in such a manner that the salient and most frequently mentioned themes or concepts are represented with the letters with larger word characters. As can be surmised from Figure 4.43, it is obvious that the object of discussion (plastic waste) is at the forefront of the Word Cloud as drawn from the interviews. The participants from the two strands of data collection phases (the survey – quantitative and the qualitative interview) highly agreed that plastic waste mismanagement and its associated problems in the study area has reached an alarming state. Subsequent upon the foregoing, the need to urgently put measures

in place to curtail the trend was equally acknowledged and emphasized upon (Figure 4.44). IBM SPSS analysis showed (Section 4.3.4.15) that the need to better manage plastic in the study area significantly increased with increasing educational status of the respondent ($p < 0.05$), and was significantly irregular across the residential areas ($p < 0.05$).

Figure 4.44

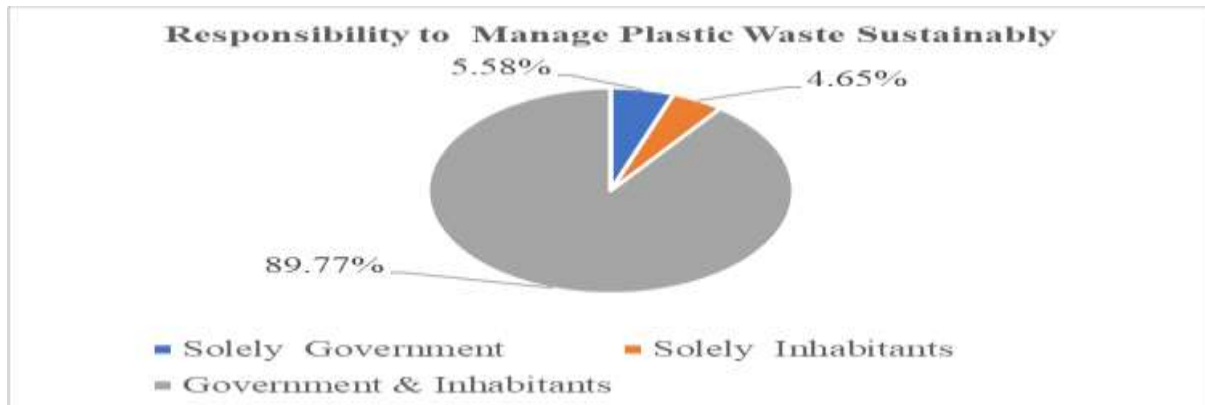
The need to Sustainably Manage Generated Plastic Waste



Building or connecting these generated word/codes gave the major themes in finding further answers to the raised research questions in line with the study's theoretical concepts. Overwhelming percentage (89.77%) of the respondents agreed (Figure 4.45) that the finding of the possible solutions to the plastic waste mismanagement is a responsibility of the Lagos inhabitants and the State Government authority. Statistical analysis showed (Section 4.3.4.25) that there is a significant positive correlation ($N=218$) between responses on responsibility to attain sustainable MWS management in the study area and increasing level of education ($\tau = 0.02, p < 0.05$).

Figure 4.45

The Responsibility to Sustainably Manage the Generated Plastic Waste

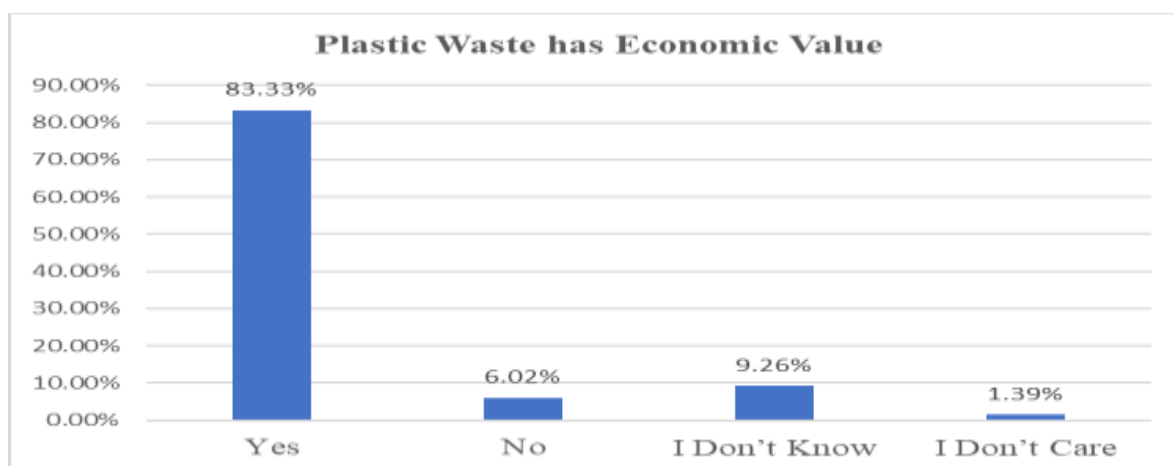


The extant solid waste management practice in the study area is characterized with government seeming to take the responsibilities of formulating policies, planning waste management intervention, and deciding what to be done. The intervention programmes can be said to be enforced on the citizens to comply with, since it is usually at the implementation stages that the households get involved. However, the research finding showed that in the present understanding, there is the need for the involvement of the households as a major stakeholder from the onset. Hence, a shift from government of plastic waste management to its governance which is in line with one of the tenets of Transition Management Theory is very key. The Word Cloud (Figure 4.43) showed that massive re – orientation is needed with the aim of achieving some behavioural changes towards the general plastic waste management matters. The re – orientation according to some of the discussants should prepare the targeted population on the circular economy of plastic, and the inherent value in plastic waste. In so doing, plastic waste definition will change from being a material that the owner does not see any economic value (see Figure 4.46) in it to a material substance that has value and can be a form of resources. Result of the IBM SPSS statistical analysis indicated that the acknowledgement of the inherent economic value of plastic significantly increased with educational status ($p < 0.05$), but decreased across the residential areas ($p < 0.05$). Drawn from

the finding was that the low educated households, in Lagos Central District are less likely to acknowledge that plastic waste has economic value than those high educated households in Lagos East District (see Section 4.3.4.16).

Figure 4.46

Acknowledging that Plastic Waste has Economic Value

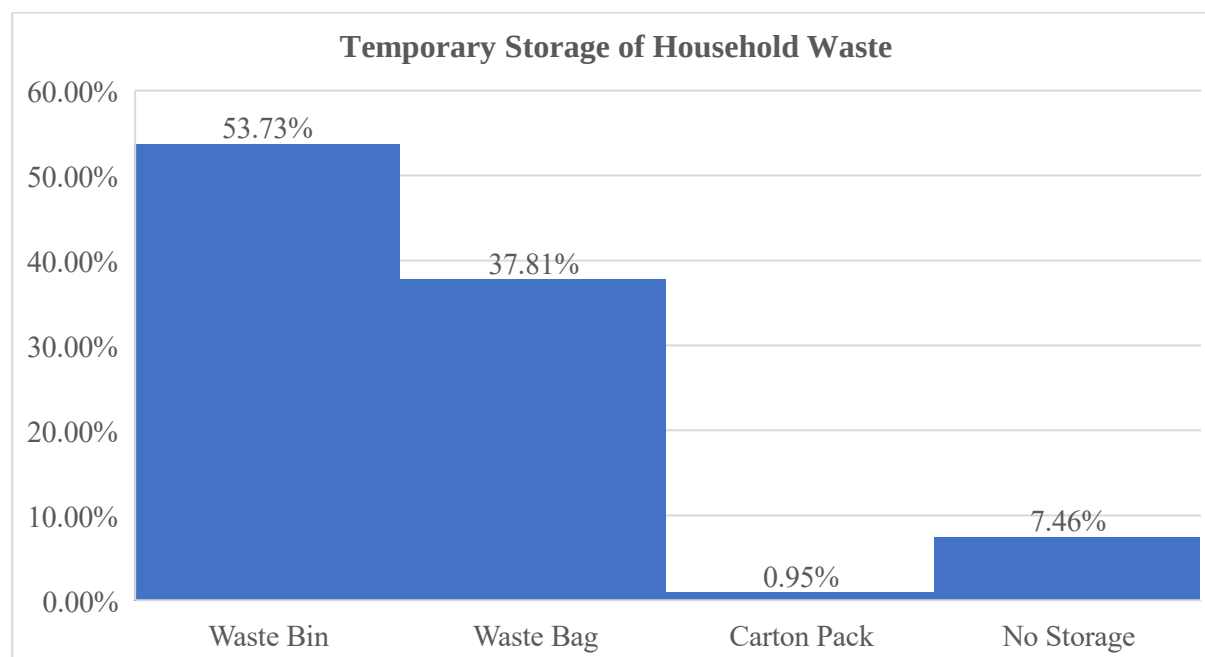


In the Macro – Level Thematic Map from interviews (Figure 4.43), it was stated that the extant solid waste management problems are human and culturally oriented while the implemented solutions are more mechanically – based. One reason for the plastic waste leakages along solid waste management chain in Lagos was the use of inappropriate waste receptacle or the lack of good waste containerization culture by the households. By the existing environmental law of Lagos State, every household is supposed to have a waste receptacle of a minimum volume of 240 litres with a proper lid or cover. One of the findings from the survey strand showed that only about 53.73% of the respondents use waste bin for waste containerization (Figure 4.47). It is worthy of mentioning that of the 53.73%, it might not be up to one quarter of the percentage that could be using the recommended 240L roller waste bin with lid (see Figure 4.42). About 7.46% of the respondents stated that they do not have waste receptacle within the household. Figure 4.55 showed some waste containerization without lid by a house and the subsequent waste dispersed on the ground and the surrounding storm water drainage channel as a result of the use of waste receptacle without appropriate covers. Section

4.3.4.2 result of IBM SPSS analysis showed that household temporary storage of household solid waste was irregular across the residential areas, but it increased with increasing educational status and economic status. The household temporary waste storage increased significantly with socio – economic status ($p < 0.05$).

Figure 4.47

Receptacles for the Temporary Storage of Household Waste



The ongoing directive of LAWMA to the Lagos households to comply to the provision of the 2017 Lagos State Environmental Law that stipulated that each household should own and use a 240L roller waste receptacle is a confirmation that household level of waste containerization is a problem in Lagos.

Figure 4.48

Abatement Notice Served to Tenements to Purchase Waste Containers


LAGOS STATE GOVERNMENT

The Owner/Occupier

WMA/WMD/692/S92/T/ 0054388

Date of issue: / / 2023

Dear Sir/Madam,

ABATEMENT NOTICE

In line with **Section 83 (1) of the Lagos State Environmental Management and Protection Law 2017** which stipulates that:

(1) "Every owner or occupier of tenement shall provide covered waste receptacles outside the tenement to be used for depositing waste and the Authority may by notice in writing to such owner or occupier prescribe the receptacle of kind and number."

In this regard, it has been observed that you have contravened Section 83 of this law.

You are therefore required to ensure with immediate effect, the provision of an **appropriate covered Plastic Waste Bin of 240L Volume Capacity** as prescribed by **LAWMA**, outside your premises, in compliance with the **Environmental Management Protection Law 2017 of Lagos State**, to avoid the imposition of the penalties prescribed by the Law.

The observed contravention(s) is/are as follows:

- No prescribed standard waste bin
- Inadequate waste bin
- Damaged waste bin
- Inappropriate placement or use of bin

In view of the above, you are expected to comply within a period of **2 (TWO) MONTHS** from the date this notice is received or risk the imposition of the appropriate penalty as prescribed by the law.

For further enquiries on bin purchase from **LAWMA**, please contact our customer care lines on **0818 423 1609, 0818 423 1592 and 0913 388 9535** or email us at **info@buylawmabin.com**


Ibrahim Odumboni
 Managing Director/CEO

LAGOS WASTE MANAGEMENT AUTHORITY

• 3, Otto Road, Ijora Olopa, Lagos. •

Toll-free lines: 5577, 07055893400, 07080601020
 E-mail: info@lawma.gov.ng Website: www.lawma.gov.ng

After the presidential and gubernatorial elections of 2023, LAWMA started the service of abatement notice (Figure 4.48) to households (April, 2023) to acquire the recommended waste receptacles or face being prosecuted. At present, intention to seal defaulting households or premises is being served round for the yet – to – comply tenements (Figure 4.49). The applied approach to this matter can be surmise to be the command – and – control approach of

government that works contrary to the principals of the Transition Management Theory. A follow – up of the Lagos State (through LAWMA) ‘Adopt a Bin’ programme, the applied approaches, and the outcomes could make an interesting study.

Sequel to the notices being served on the adopt a bin matters, several complaints and narratives have flooded LAWMA offices across Lagos State and some on the social media. One of the noticed complaints is the acclaimed lack of public awareness on the law that stipulated that households must own and use a 240L waste bin with lid. One of the reasons given as to why previous efforts to sustainably manage plastic have not yielded tangible results

Figure 4.49

Intention to Seal Notice



is the lack or inadequate stakeholders' engagement (Figure 4.50). Mentioned also in this category is the existing societal poverty. There might be the willingness to purchase the bins by the inhabitants while the lack of financial capabilities will hinder the acquisitions of the bins and subsequently, a higher possibility of resistance to the Government's policies.

Figure 4.50

Macro – Level Thematic Map from Interviews



Macro-level Thematic Map of Extant Plastic Waste Management and Ways towards Transitioning to a Circular Economy of Plastic Waste Management in Lagos

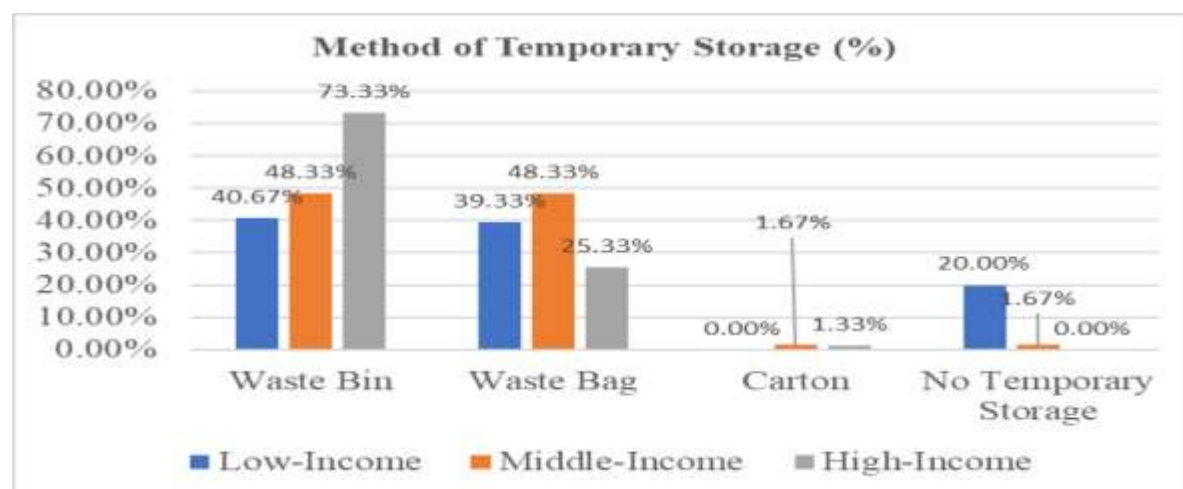
Note. Self - developed

Poverty as one of the reasons for the improper use of waste receptacles for the containerization of municipal solid waste by the households in Lagos can further be confirmed by considering the use of different types of waste receptacles across the socio – economic strata of study. The result showed that the respondents from the High – Income areas have highest level of compliance to the use of waste bin for the temporary storage of household waste (see

Figure 4.51). About 73.33% of the respondents from High – Income area claimed they use waste bin for temporary waste containerization within the household. This is followed by the Middle – Income respondents (48.33%) while that of the Low – Income was at 40.67%. It is worthy to mention that the aforementioned percentages do not necessarily mean the use of the appropriate or Lagos State Government – approved waste receptacles. It can thus be surmised that the higher the income level, the more compliant the households to the recommended waste receptacles use. Also noticeable in Figure 4.51 is that the issue of households not having temporary waste storage receptacles does not exist within the High – Income areas. Meanwhile, it is inferable from the result that the lower the income area, the more the number of households without waste receptacles. Details of statistical inference can be seen in Section 4.3.4.3 on the result of SPSS statistical analysis.

Figure 4. 51

Type of Waste Receptacles used across the Strata

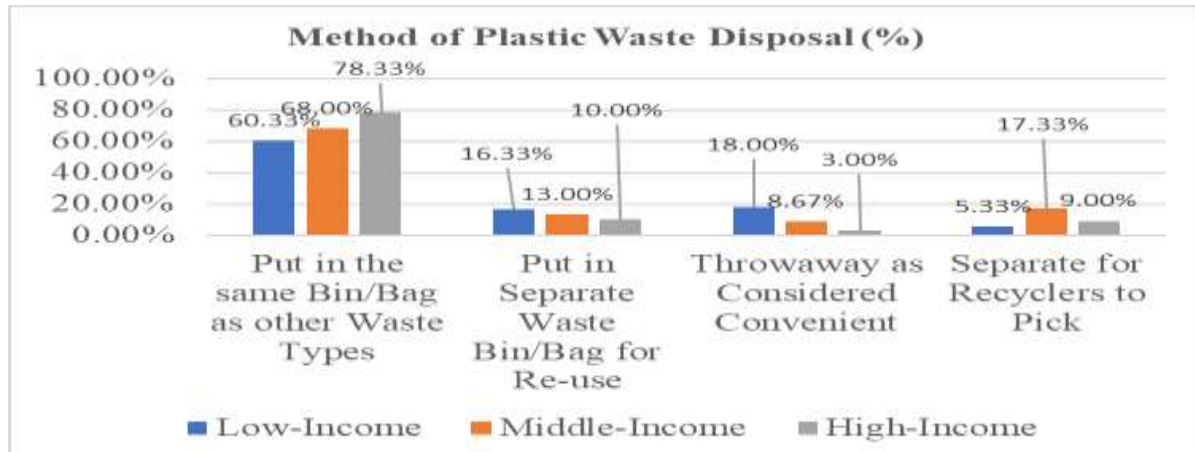


In a near similar vein, enquiry into how the household generated plastic waste were disposed showed that 78.33% of High – Income respondents comingled the plastic waste with other waste and containerized it in waste bins/bags. The Middle – Income showed 68.00% while that of the Low – Income was 60.33% (Figure 4.52). A look at one of the unfriendly environmental attitudes or the habits of throwing – away plastic waste as considered convenient

by the households showed a reversed trend when compared to the use of waste bin across the three Socio – Economic strata considered in the study. The Figure (4.52) showed that 18.00% of the respondents from Low – Income areas throw – away domestic plastic waste as they considered convenient, the Middle – Income had 8.67%, while that of the High – Income areas stood at 3.00%. Specifically, the finding showed that, the older age groups of households, in low size nature of dwelling, in Lagos East District and in low economic stratum are less likely to store household waste temporarily than those younger age groups, in high income dwelling units, in Lagos West and Central Districts, in high economic stratum (Section 4.3.4.3). On a more positive side, it was observed that the plastic waste separation for re – use purposes was highest (16.33%) with the Low – Income areas, followed by the Middle – Income (13.00%), while that of High – Income was 10.00%.

Figure 4.52

Methods of Plastic Waste Disposal across the Socio – Economic Strata

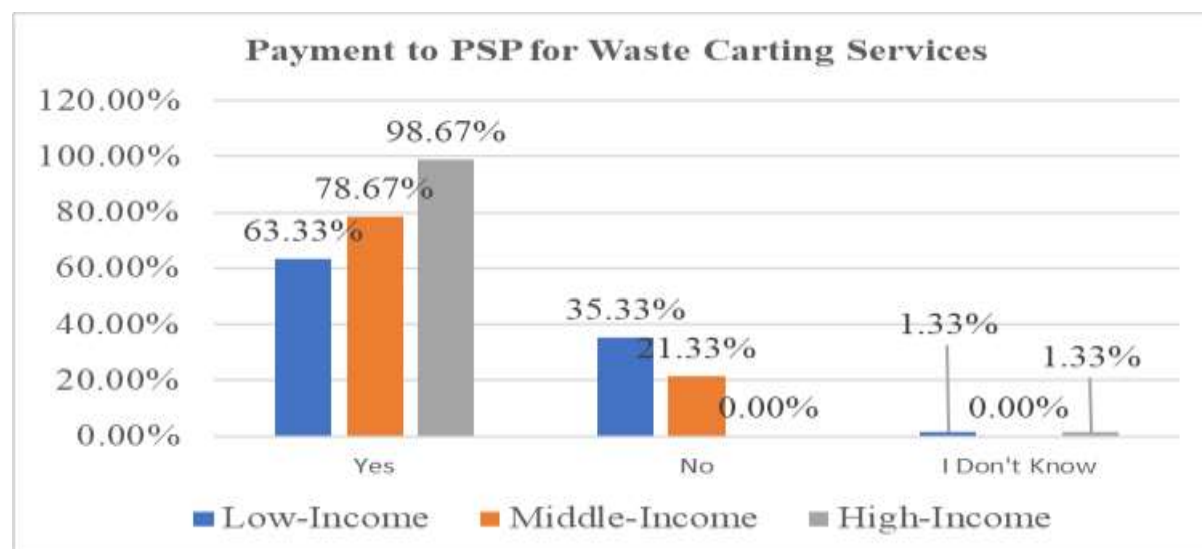


The payment to Private Sector Participants (PSPs) in waste carting, transportation and disposal across the three socio – economic strata showed a trend of highest percentage (98.67%) by the High – Income area dwellers, followed by the Middle – Income area dwellers (78.67%), while the least (63.33%) was that of the Low – Income area dwellers (Figure 4.53) from Microsoft Excel descriptive analysis. Similar findings were observed doing SPSS statistical analysis that showed that, household payment of waste service charges increased

with increasing educational level, and increasing socio – economic status. With a chi – square test of independence, households in the low nature of dwelling units, in low economic stratum are less likely to pay for waste disposal services than those in high dwelling unit, in higher economic strata.

Figure 4.53

Payment to PSP for Waste Carting Services



Evaluation of Findings and Reconnections with Literature

The data gathering and analysis were carried out in two phases. The initial phase was through a survey that was carried out by the administration of hand – delivered and self – administered questionnaire. The questions were well – structured to gather the opinions, culture, beliefs, and practices among others of the study population toward sustainable solid waste management within the State. The gathered information was analysed using Microsoft Excel spreadsheet and IBM – SPSS. The second strain of the research was basically qualitative data collection through one – on – one interviews and Focus Group Discussions (FGDs). The gathered information was analyzed using Word Cloud software to create word class of relevant words. Through thematic analyses, findings were deduced for the qualitative phase which gave answers to much of the researched questions. The evaluations from the findings were carried out using the research questions as a guide. In section 4.5.1, the survey portion which was

basically in Research Question One (RQ1) was discussed, while section 4.5.2 – 4.5.5 took care of findings from the qualitative phase, covering Research Question Two (RQ2) to Research Question Five (RQ5). The summary is presented in section 4.5.6.

Evaluation to the Findings from Research Question One- Survey portion

(Sustainable Solid/Plastic Waste Management Attitudes, Culture, Beliefs and Practices).

Pro – environmental behaviour is the tendency that an individual has with a mindset to always make efforts to ensure that his/her actions will not have adverse consequences on the environment. The individual makes effort to ensure that any avoidable negative impact on the environment is minimized. In the same light, the individual tries to see that his/her action(s) can have more positive impact on the natural environment. Women often have more pro – environmental values than men (Digby, 2012). Simply presented in another form, gender behaviours towards environmental concerns are affected by the environmental value that the gender holds. This gender divide is capable of shaping the environmental outcomes or interventions depending on the gender reached and whose responsibility it is to carry – out the required duties in the concerned community. In most developing nations or low – income countries of the world, like in Nigeria, women have been known to be more vulnerable to the harmful effects of environmental pollution, ecosystem damages and poor sanitation (OECD, 2020). That women hold more pro – environmental beliefs, values, attitudes than men in relation to environmental sustainability has been consistent in findings from 1990 (Li, 2022; Xiao & Hong, 2017; Norgaard & Richard, 2005). Consequently, they are known to be more active and participate better in the private area of environmental behaviour more than men do (Xiao & Hong, 2017). The initial management of household waste at the household level remains in the women’s purview (OECD, 2020). The present study has a mix of almost equal amounts of respondents of the two genders, giving a likely balance in retrieved information.

Most times when environmental degradation activities are mentioned, people often focus on the industrial or large – scale operations while neglecting individual actions of adults or their personal decision which is capable of impacting on the natural environment. It has been noticed that environmental nuisances/problems arising from individuals are on the increase and yet, some of the individual perpetrators seem not to know the environmental consequences of their actions (Digby, 2012). This, could portend danger for the environment where individual citizen's environmental literacy is low. Environmental literacy could be described as the measure of an adult's knowledge of the environment which could affect his/her behaviour or attitudes towards the environment's sustainability reasoning or actions (Digby, 2012). Adult is here emphasized since in general, the assumption is that, they can make decisions on their own and be responsible to the outcome of their action(s). However, the relationship between age and pro – environmental behaviour has remained controversial.

The age of targeted respondents for the survey was between 18 – 70 years. The legal voting age of a Nigerian citizen is from the age 18 years and at this age, the person stands responsible for his or her actions. The age of maturity is similar in most Africa countries. The need for completion of guardian forms for seeking permission to interview the person does not arise. The majority (83%) of the survey respondents were within the age level classifiable as youths (18 – 49 years). The Nigerian National Youth Policy (2009) classified Nigerian youths to be citizens from the ages of 18 – 35 years. According to Abiolu (2018), the Nigerian Baptist Youth Convention recognizes people between 18 – 45 years as youths. Being 70 years is the maximum age target for the respondents on the premise that at such age, the respondent that is healthy, will not be in loss of memory, nor is it needed to take permission from potential caregiver before the interview. Pona et al. (2021) stated that the average global life expectancy of humans is between 60 – 70 years, even though that of Nigeria is presented as 54.4 years.

The attitude that individuals possess with respect to a specific matter determines their behaviour towards that matter. Attitudes are about one's personal dispositions which affect their actions (Ogunjinmi & Oniya, 2016). The majority of the extant environmental problems are man – made as a result of human maladaptive behaviours. Since the attitude towards an issue influences one's behaviour towards it, it may suffice to say that, for a behavioural change to be achieved, there is need for the change of the people's attitude with respect to the specific matter. Education among other things is known to contribute to one's knowledge of a subject such as environmental matters and hence, may change one's disposition and attitude towards pro – environmental behaviour when and where the education helped to produce positive attitudes (Ogunjinmi & Oniya, 2016). The survey instrument was a questionnaire that was hand – delivered and self – administered, hence, it is expected that only those who can read and write were the study participants. The educational status of respondents as indicated (Figure 4.4) showed that over 94% of the respondents had attained the educational level of a secondary school and or above. With this educational status and the visibility of the plastic nuisances within the metropolis of Lagos, it is expected that the respondents should have that ability to be concerned with their social welfare and discuss sufficiently on matters concerning the current study. Thus, the findings of this study may not reflect the opinions, belief attitudes, amongst others of the Lagos residence who cannot read English language averagely.

Meyer (2015) asserted that education influences humans to show more interest in their social welfare, which subsequently will make them act more friendly towards the environment on an individual basis. It must be noted that education could be formal or informal. People could also behave in a certain manner towards the environment where they are in groups and are influenced by the behaviour of the head of the household or often directed to act on set rules and regulations of the household. For instance, some practices around Africa holds it a taboo to exploit some forest or temper with animals therein as a way of protecting the

environment while in some quarters, it is a taboo to leave domestic waste overnight within the area where it is generated around the living environs without appropriately disposing it (Ogunbode et al., 2018). In a simple statement, individual behaviours towards the environment are influenced by the environment or companies that they keep. The finding showed that householders from High – Income area have highest level of educational attainment when tertiary and secondary educational level are combined. The educational attainment level trend dwindles downward through Medium – Income areas to the Low – Income Areas across the socio – economic strata. This trend becomes very important to note with the established understanding that where education is lacking or the basic knowledge of adverse implications of the actions of individual householders is low, it could hamper the level to which that individual may want to willingly participate in sustainable SWM programmes.

Different categories of householders from different household sizes made up the study respondents as indicated in Figure 4.5. The majority (70%) of the respondents are from households of more than two householders. Observations showed that the inherent household's environmental management knowledge has a way of influencing good environmental management practices of householders (Amoah & Addoah, 2020; Ogunbode et al., 2018). Previous studies further asserted that the higher the number of householders, the more there are available hands to participate in maintaining a cleaner environment, since their study population in Ghana practices community environmental management, just like most of the developing countries.

It should be recalled that the selected wards for data capturing were selected based on the visible socio – economic status or classification of the areas. Thus, there were areas classified as High – Income (HI), Middle – Income (MI), and Low – Income (LI) areas. The nature of housing units around the areas concerned could be a reflection on the classifications. Succinctly put, the nature of dwelling tends to be different with respect to the socio – economic

classification of the neighbourhoods (cf. Onifade et al., 2019). Taking a clue from Figure 4.6 that showed the nature of the dwelling units of respondents, using the three HI areas, it could be easily observed that the dominant nature of dwelling places is the flat system, followed by self – contained homes and duplexes without room systems. The three MI areas have in average, a lesser number of flat systems as compared to the HI areas, and in the same vein, the MI areas have more dwelling areas with self – contained homes than the HI areas. There seems to be an outlier among the three MI areas and it is worthy to mention that the area in question (Lagos East- MI) is a housing scheme of Middle – Income estate built by the Government over five (5) decades ago (cf. Adebayo & Iweka, 2013). A similar trend continues with the LI areas where the average dominant nature of dwelling is the room system followed by self – contained homes and flat system without the record of a duplex system of dwelling. This trend is almost a reversal of the population density as those in HI areas with better housings seems to have lesser occupants as compared to the MI and LI in a downward trend. Onifade et al. (2019) in a study found out that areas with low a population density usually have no room system for dwelling in Lagos. When the dwelling unit and number of occupants is looked into, it is observed that the LI areas are more densely populated. Sequel to this understanding, it may be necessary that the MDAs on whose purviews lies strategizing for the establishment of sustainable SWM in the study area should not only use size of dwelling places as criterial for provision of SWM infrastructural facilities in areas needing intervention programmes. But also consider the population and the population densities to develop context specific strategies as waste management decentralization is pursued.

As part of a check/verification plan to see if the researcher and the respondents were on the same page with respect to the understating of municipal solid waste, a question was used to know if the households generated waste within their households. The findings are presented in Figure 4.7 showed that the majority (86%) agreed to the generation of municipal solid waste.

This, is an indication that the majority of the respondents have some clue of the nature of waste being discussed, hence were expected to respond appropriately. The other 10% of the respondents claimed they do not generate municipal solid waste while the remaining proportion of the respondents claimed they do not know whether they generate such or not from their households. This could be as a result of not being sure of what the municipal solid waste meant or a lack of interest on the topic/discussion. Though municipal waste is usually generated from many sources of human activities. Some studies have shown that the majority of municipal solid waste (between 55 – 80%) are generated by households in developing nations (Abdel – Shafy & Mansour, 2018). How the generated waste from the household is treated by householders goes a long way to contributing to the general sustainability of solid waste management within the neighbourhood. Just like the saying, “charity begins at home”, hence sustainable solid waste management must start from the household. It was emphasized that, no matter the solid waste management strategy of a community, it is necessary that the waste must first be collected for further treatment (cf. Odonkor et al., 2020). Knowing that one’s activities lead to the generation MSW that requires further action(s) to ensure that it does not lead to the constitution of nuisances could facilitate the institution of positive strategies to help nib the would-be problem at the bud. The reverse is likely the case when an individual refuses to acknowledge the generation of MSW from the household’s activities; he or she is likely not going to bother on what the acclaimed unrecognized waste may cause to the society in general.

Lagos State Government assigned PSPs in solid waste collection, transportation and disposal usually collect residential solid waste on a weekly basis. However, there may be some other arrangement between the PSPs and the clients they service. The responsibility of the household is to store the waste temporarily until the waste is picked by the PSP. It is therefore necessary that the household should have a temporary waste storage container(s) within the dwelling unit. LAWMA (2021) specified that every dwelling unit must have a temporary waste

storage facility as the PSPs are to collect waste once every week from residences. There is however a seeming lacuna as the nature of waste container was not specified. A check on whether the respondents have a temporary waste storage and the nature within the dwelling unit showed that (Figure 4.8) about 7.0% of respondents do not have a temporary solid waste storage facility in their dwelling unit. Of this percentage, most (93%) are in the Low – Income areas across the three districts. This could be obtainable in such a manner because there may be no space to store waste within their shared kitchen as it is common with room systems of dwelling where, toilets and kitchen facilities are shared by different households dwelling in the same premises. In some cases, the tenants create a communal dumpsite within the neighbourhood where individuals throw their waste frequently on generating the waste (Odewumi, 2013). The majority (93%) of the respondents have temporary waste storage containers within the dwelling unit, and all dwellings in the HI areas had. However, it is worthy to mention that those having temporary storage for waste in their dwelling use different containers ranging from plastic, waste baskets/bins, aluminum foils, plastic bags and, used carton/boxes. For the establishment of a waste management system that is sustainable, there will be need for households or dwelling units to properly containerize the household waste in a set pattern that will involve waste sorting at source (Odewumi, 2013). With around 7% of respondents indicating that households do not have waste receptacles within the dwelling premises, such households will definitely device ways to be throwing away the generated waste. This means of throwing the waste on generation is likely to be through illegal means; resulting in indiscriminate dumping that exacerbates plastic waste littering in the State.

The effect of households' mismanagement of solid waste to the public is enormous as it cuts across health, economics, and, aesthetics (Fadhullah et al., 2022). In order to encourage or bring about proper solid waste containerization, towards a cleaner Lagos, the State Government through LAWMA launched the 'adopt – a – bin' programme on the 23rd of

February, 2022 in Lagos. The initiative came with the intention to educate the general populace on the need to use standard containers for the containerization of waste by residential and commercial premises in Lagos (LSG, 2022). The programme involved the distribution of about 40,000 standard waste bins with installed tracker devices. The bins come in two major colours of green and blue. The green – coloured bin is for general waste while the blue – coloured bin is meant for recyclables. Thus, the initiative was also meant to bring to the fore the habit of waste sorting at source in order to promote recycling in the state (LAWMA, 2022). One of the ways that the households have contributed to the extant plastic waste mismanagement in Lagos has to do with improper in – house solid waste storage and management. A household without standard waste containers may not be able to participate in waste sorting at source. More so, since some do not have temporary waste storage, before the pick – up by assigned PSP, they usually may decide to do away with the daily generated waste through indiscriminate dumping in open spaces, gutters and, road median. In some cases, those who have bin/baskets may be using the ones without lid/covers and may also be too small to contain a week – long waste generated. Thus, the waste overflows while the lighter ones like some plastic and paper materials are blown – away by the wind. The Low – Income households are known to generate more organic waste than High – Income households and the organic waste are liable to decay or putrefy faster, and as such the tendency not to store it for long within the household is higher (Wilson & Scheinberg, 2010). The situation can be aggravated by the lack of space in their dwelling systems or non – availability of fund to buy the standard waste containers/receptacles.

A test of the knowledgeability of the respondents on the generation of plastic waste by the households showed (Figure 4.9) that most (93%) respondents claimed that plastic waste is part of the household waste generated within the dwelling as a result of the householder's activities. This, also indicated that nearly all the respondents know the specific waste type that the study is concerned with. A glance at the aforementioned figure showed the presence of an

outlier with respect to the information with LI, Lagos West District where nearly all of the respondents claimed they do not generate plastic waste from their households. However, Sanmi et al. (2020) asserted that plastic is virtually found almost everywhere in the society and that in this present world, it is almost impossible to do without the use of plastic or the variants of synthetic polymers. More so, it is surmised that countries with low – income growth are the ones generating a higher number of plastic wastes in the recent past. This could be one reason to question the observed outlier in the gathered data since a great deal of household items and packaging components are made of plastic materials that are known to be cheaper materials (Olusunmade et al., 2019).

An overwhelming percentage of the respondents (92.1%) acknowledged that plastic waste is part of the general household waste which necessitated further inquiry into how the household's plastic waste is disposed. The findings showed that the majority (64%) of respondents combine all household waste for disposal. However, this does not mean that the remaining 36% separate their plastic waste from other household waste, since around 10% claimed that the generated plastic wastes are disposed in the ways they felt convenient. It could be inferred that the remaining 26% do practice plastic waste separation within the household. The survey finding showed that approximately 13.4% of respondents separate plastic from other waste for their reuse while 10.4% of respondents separate plastic waste from other waste for plastic waste recyclers to pick (see Figure 4.10). In this regard, Babayemi et al. (2018) stated that, of the humongous volume of plastics that enters the Nigeria's anthroposphere, not up to 12% of the generated plastic waste is recycled and this is as corroborated by Kehinde et al. (2020). Wilson et al. (2021) stated that the production of plastic is on the rise globally, but that on the average, less than 10% of resulting plastic waste is recycled worldwide. The remaining plastic wastes are either burnt in the natural environment or dumped indiscriminately in open spaces, gutters, bodies of water and, deposited at dumpsites. This observed trend

needed to be put to a halt with implementation of strategies that will place the nation on a path towards sustainable plastic waste management practices that is globally acceptable (Kehinde et al., 2020; Akanle & Shittu, 2018; Babayemi et al., 2018). However, some respondents, amounting to about 4% of the sampled respondents did not respond to the question.

It is almost becoming a norm to see different types of plastic waste littering the Lagos metropolis and the adjoining rural communities. Henrich Boll Foundation (2020), asserted that in this extant world civilization and technological advancement, that humans' touches plastics more often than they do touch their loved ones in their everyday activities. It is further stated that plastic can be said to be ubiquitous; found in the air, water, land, natural and man – made objects, in plants and animals, and even in a human system (Yee et al., 2021). The plastic waste ubiquity in Lagos and Nigeria at large has been emphasized by some papers requesting that action should be carried out to stop the trend (Yalwaji et al., 2022). Kehinde et al. (2020) claimed that mismanaged plastic waste could be found in drainages blocking free flow of storm water that leads to flash flooding and deterioration of roads in Nigeria with severe adverse effects.

In view of the assertions presented in the earlier sections, it became necessary to sought the opinion of the sampled population and to know if they do observe these plastics within the metropolis and where they observe them most. It was revealed that most (95%) respondents have seen plastic waste within the metropolis of Lagos (Figure 4.11). This is a pointer to the fact that the majority of the study respondents noticed that plastic waste of different types littered the Lagos environment as earlier stated by some authors (Onyekachi & Chukwuemeka, 2022; Yalwaji et al., 2022) and this study. Thus, there is an acknowledgement of the littering nuisance of plastic waste in the city, which could be a plus to agreeing that action(s) is needed to curb the continued perpetration of the plastic waste mismanagement in the study area.

Since the overwhelming majority attested to have seen plastic waste littering within the metropolis, further enquiries were made to know those who will identify to the use of plastics in the households. Around 88.4% of the respondents agreed to the use of plastic materials while the remaining 11.6% claimed not to have used a plastic material/product before. Among this claim of non – use of plastic materials by some respondents, the outlier from one ward remains prominent. As is observed in Figure 4.12, the Low – Income area of Lagos West District indicated an outlier where 76.0% respondents claimed that they have never used plastic products. The preceding is contrary to observation on the current trend in the use of plastic in many products. Henrich Boll Foundation (2020), stated that irrespective of how conscious people may be in this modern world, that it is almost practically impossible to avoid the use of plastic materials and that a plastic – free life can only be lived by some privileged few in the entire world as this type of living will need some amount of financial access to achieve.

An enquiry into how often the respondents use plastic material/products showed that around 64% of respondents use plastics on a daily basis. About 21% of the respondents claimed they use plastic on a weekly basis while about 4% acclaimed the use of plastic monthly. Meanwhile, only circa 7% declared that they never used plastics (Figure 4.12). It is noted here for a possible further investigation on this seeming outlier from the same ward of LI, Lagos West District.

The purchase of plastics by households showed that over 90% of respondents claimed that they do purchase plastic materials, though at different frequencies as shown in Figure 4.13. About 86.4% indicated that they purchase plastic materials on a daily basis. Ansari et al. (2017) asserted that one of the commonest items in this modern world are grocery bags made up of plastic materials, preferred to other bags because of its strength, cheapness, light – weight, convenience, and impermissibility to water. They are good when the need to deliver goods from the shops to homes and also good for storing the goods at home or in the offices. These

same qualities, somehow makes them harmful and difficult to handle their waste and when mismanaged as it is prevalent in the study area. A situation that leads to a lot of adverse environmental effects and economic losses. Despite the disadvantages of its use and mismanagement, its production is on the rise, especially in countries without stringent regulations like China (Ansari et al., 2017) and Nigeria (UNIDO, 2021).

Plastic waste mismanagement in Lagos metropolis is very evident from the sight of the waste in the city centre, open land spaces, gutters, body of water, among other places (cf. Henrich Boll Foundation, 2020; Kehinde et al., 2020; Nubi et al., 2019; Babayemi et al., 2019; Babayemi et.al., 2018). It was therefore enquired from the study respondents, if they have noticed the plastic waste wrongly situated within the metropolis of Lagos. As would be expected in corroboration with the report of other scholars, over 95% attested to have observed plastic waste littering in Lagos. This is a pointer to the fact that even visual observation showed that plastic waste littering has drawn the attention of the majority physically (Figure 4.14).

It is already established that plastic waste littering in the metropolis is real. Now, it is important to know where these plastic wastes are more frequently observed. The findings showed that approximately 41% of the respondents claimed to have seen plastic waste around market vicinities. Ajoku and Okoro (2020) surmised that, the major sources of plastic wastes in Nigeria are the households and the commercial entities that could comprise of the industries and market places. In this case, plastic waste is most frequently observed at the market areas where buying and selling are at their peaks and mostly single – used nylons are employed to wrap and carry goods of virtually all sorts. The major shopping bags in modern day Nigeria is plastic in nature and plastic waste is second after food remnants in Lagos waste characterizations (Dumbili & Henderson, 2020). About 30% of respondents claimed to have seen plastic waste littering in the storm water drainage channels around the metropolis while around 22% have seen plastic waste littering on the streets, roads, and road – setbacks. Other

remaining respondents observed plastic wastes floating on bodies of water, open spaces/bushes, parks and gardens (Figure 4.15). This indicates that with the ordinary eyes, the physical nuisances constituted by plastic waste mismanagement in the State is evident and requires necessary measures to curtail it.

Different waste types and mostly plastic littered most Nigerian environs (Figure 4.54), especially the land and water which have contributed in no small portion to the observed flood disasters and other environmental degradations as could be physically observed (cf. Aderoju et al., 2019). Without the abatement of these plastic waste nuisances, it will be impossible to achieve some set targets of Sustainable Development Goals (SDGs), such as goal 11 (sustainable cities and communities), goal 12 (responsible consumption and production) goal 14 (life below water), goal 15 (life on land), amongst others (UN, 2018).

Figure 4.54

Indiscriminate MSW Dumping and littering in Lagos Metropolis



Note. (Self – taken)

Having established that the majority (95%) of the respondents observed plastic waste littering in the Lagos metropolis, it was determined further if the observed littering was acceptable and over 75% of the respondents said it was not acceptable to litter the environment with waste (Figure 4.16). The populace understood that plastic waste should not be seen littering the environment, yet, the habit of indiscriminate waste dumping and waste leakages continued unabated in the Lagos metropolis. Such a city could be said to be locked – in to

unsustainable socio – technical system of solid waste management (cf. Truong et al., 2022). It will therefore take some concerted efforts to free the State from this socio – technical lock – in to the obtainable unsustainable solid waste management practices.

To a ‘yes’ or ‘no’ question to determine the respondent’s awareness of the environmental problems associated with plastic waste mismanagement, it was realized that over 86% of the respondents are informed on the adverse effects associated with plastic waste mismanagement. The remaining respondents claimed that they are not aware of the problems associated with extant plastic waste management practice in the mega – city of Lagos (Figure 4.17). Such individual who claimed not to be aware of the problems associated the current plastic waste mismanagement are likely not to see reasons why attentions or efforts should be made to abate the seemingly non – existing nuisances as claimed. There is therefore need to further educate the populace on the adverse implications of the obtainable plastic waste management practices through massive advocacy programmes.

Among the listed issues associated with plastic waste mismanagement where the nuisances of plastic waste were observed by the respondents within the metropolis showed that the majority of the respondents noticed that it leads to the blockage of the water drainages (Henderson & Dumbili, 2021; Kehinde et al., 2020). This is actually a common scene, especially during the raining seasons, plastic waste in the drainages stopping the continuous flow of storm water to overflow the drainage and spilling to the main roads or streets. This often results into flash flooding (Ojolowo & Wahab, 2017) in some areas and contributes to the eroding of the road or tarred surfaces. The blocking of drainages also allows for storm water percolations in the channel, creating an enabling environment for the breeding of mosquitoes, a known vector for malaria parasites (cf. Kumi – Larbi et al., 2018). Next to the blockage of the drainage channel is the general littering of the environment and the destruction of the natures’ environmental aesthetics (Figure 4.18). Some unsecured plastic wastes are very light

and are easily blown away or around by the wind and often deposited some distances away from where there were disposed, ending up on some trees, garden plant, fields, bushes, water bodies, and see – through wire gauzes (cf. Ajoku & Okoro, 2020).

The knowledge of the plastic degradability among respondents showed that more than half indicated that plastics are non – degradable, while around 17% claimed that plastic waste is biodegradable and the remaining respondents were indifferent (Figure 4.19). Chamas et al. (2020) and Gaur et al. (2020) asserted that the degradability properties of plastics remain very poor and that the resulting consequences are now of global concerns. The non – biodegradability of plastic is a great cause for concern, especially in developing nations where dumping of wastes is carried out without the necessary treatment and dumpsites are used instead of sanitary landfills. Taghavi et al. (2021) stated that regardless of where plastic waste is generated from, that its amassment in the natural environment can result in serious adverse effects. Toxic compounds such as phthalates, bisphenol, ethers, plasticizer, among others that endanger life on land and water are released where plastics waste accumulates on the body of water. They further surmised that, it may take a decade to a thousand years for thermoplastics waste degradation naturally, depending on the environmental conditions and the type of plastic material (Taghavi et al., 2021). Most commonly known plastics polystyrene, polyethylene (PE), polyethylene terephthalate (PET), among others degrade very slowly that it is believed that they take centuries for some of their degradations to occur and that the fragmentation to smaller portions leads to the formation of micro – plastics that are harmful to organisms when ingested (Kubowicz & Booth, 2017). However, in some quarters, it is claimed that plastics never degrades (Chamas et al., 2020). FAO (2021) reported that accumulation of plastic waste on the natural environment brings about the contamination of the receiving natural body and that when plastics disintegrate, their resultant fragments, especially the micro – plastics

somehow find their way into the food chains. The accumulation of micro – plastics in food chains portend health danger for human and food safety.

The unfortunate aspect of this matter is that, despite the knowledge of the consequences of plastic waste accumulation in the natural environment, people still carelessly dispose of used plastic indiscriminately as a result of lack of a sound waste treatment system (cf. FAO, 2021; Taghavi et al., 2021) and sticking to unsustainable ways of doing things for conveniences sake.

At this juncture, it was necessary to find out if the respondents think that there is need for a better management of plastic waste in the metropolis. An overwhelming percentage of the respondents are in agreement that there is a need for a more sustainable management of plastic waste within the metropolis (Figure 4.20). In a similar vein, it was acknowledged that plastic wastes have economic value (Figure 4.21), but, if that is so, why the continued indiscriminate disposal of valuable material? Though, it was claimed that about 76% of the respondents reuse plastic materials as the need may have arisen (Figure 4.22). However, only about 38% of respondents claimed to practice waste separation within the households while the remaining 62% comingle generated household waste (Figure 4.25). Those that separated plastic waste from other waste might not follow up to sustainable management practices for plastic. Some end – up burning the plastic waste to reduce the volume of waste generated while others segregate plastic for reuse or for sales. Figure 4.26 showed that, 15.5% of those who separate plastic waste do give the plastic waste to LAWMA – approved PSP, 28.2% disposed the accumulated plastic like other municipal solid wastes. About 11.0% claimed they sell the segregated plastic waste, 27.3% usually give the segregated plastic to people who indicated they needed them, while 19.1% of the respondents segregate plastic waste for their reuse. Where plastic waste separation from other waste types is practiced within the household is very encouraging. Unfortunately, for one reason or the others, some of the segregated plastic wastes are carted away in the same compactors as mixed waste, where and when the motor boys are

not interested in the segregated plastic waste. Like earlier mentioned, some households segregate plastic waste in order to reduce their volume of waste, such households end up dumping the plastic indiscriminately or burn them. This practice is a setback to effort put in place to separate the waste in the initial place. In this regard, the purpose of encouraging plastic waste segregation needed to be emphasized and made clearer for the populace, and the idea of government approved waste carting PSPs to have compartmentalized trucks to pick different recyclables is very important.

For those not practicing waste segregation from source, several reasons were given and some of these are, no knowledge of any law demanding that household should sort waste at source, other saw no good reason to practice waste separation, while the others claimed that they do not have the needed standard containers to do so. Another fraction of the respondents claimed that waste separation is a costly venture, that it is time consuming, difficult to do and that plastic recycling has very low return on investment. Yet, others claimed that they do not know where to sell the segregated plastic (Figure 4.27). All mentioned excuses for not separating plastic waste at household levels are signs of drawback to the desired sustainable plastic waste management in the State. These excuses amongst others are worth recognizing by the authorities responsible for establishing sustainable MSW management, in order to create a more enabling environment that could encourage acceptable practices. Some FGD discussants and individual face – to – face interviewees suggested subsidy consideration for the very poor areas in the acquisition of the recommended waste receptacles, among others in the like manner.

The finding showed that over 92% of the respondents are willing to participate in a plastic waste recycling programme and are ready to separate waste at household level if the government carried the people along in their planned programme/initiatives (Figure 4.28 & 4.29). Circa 90.2% of respondents agreed that the major responsibilities for sustainable

management of plastic waste in the metropolis should be of the government and citizens at large (Figure 4.30). The willingness to participate in government – initiated programmes geared towards minimizing plastic mismanagement showed an interested society ready to help combat plastic waste nuisances in the State of Lagos. The desire to participate seemed higher in HI area than MI and that of MI being more than LI. The waste disposal method by household showed similar trends, the HI areas are more compliant to using government – approved PSP than MI and LI.

The majority of the households do pay for waste service charges as 80.2% indicated, while about 18.9% of household do not pay and the remaining percentage could not tell whether their household does pay for waste carting from the household. The trend of payment showed that HI was compliant as compared to MI and LI in declining order (cf. Oyawole et al., 2016). The observed trends give an idea of the trend of indiscriminate MSW dumping across the stratified socio – economic levels. This observed trend could be capitalized on in strategizing for communities' waste management in their peculiarities when decentralizing MSW management arrangements.

To curtail the nuisance arising from plastic waste mismanagement in Lagos, it is advocated that the circular economy of plastic should be aimed at. The circular economy concept emphasizes on closing the loop from the practiced linear metabolism of plastic waste. One way that the Lagos State government intends to follow is the massive recycling of plastic waste in the state. PAKAM App was developed to help the inhabitants of Lagos to participate in waste sorting, thereby getting involved in the plastic recycling initiative. Only about 8.1% of the respondents who claimed to be aware of the existence of the App have participated in its use in Lagos (Figure 4.37). Through the use of the PAKAM App, it is intended that informal sectors involved in recycling either as a mean to make ends meet or geared towards sustainable management of the waste will be brought under one canopy. Those on the value chain of waste

recycling in this regard are the waste pickers, collectors, and scavengers, as well as aggregator/recovered waste merchants. The plan is to register the aforementioned, train them and incorporate them into the Lagos Recycle Initiative (LRI) where companies of different sizes operate. The PAKAM App, training and incorporation into the LRI will bring about a steadier and more organized flow of material collection from generators. By so doing, the amount of plastic reaching the dumpsite will be reduced and plastic waste leakage along the value chain of solid waste management will be reduced in Lagos metropolis (UNIDO, 2021). Excerpt from the findings as described earlier are as presented in table 4.3.

Table 4.3*Table of Graphic Representation of Survey Results of Variables at a glance*

SN	Variable	Pro – Environmental Behaviour	Collaborating References
1	Education	a. Higher educational attainment is a positive determinant factor on the willingness to pay for environmental services and pro – environmental behaviour. b. Those living in High – Income area have higher educational level.	Tianyu & Meng, 2020
2	Dwelling Environment	a. The more organized the dwelling environment, the more concerned for the environment improvement. b. The higher the Income area, the more of Duplexes and Flat systems. c. Indiscriminate dumping is more prevalent with the lower incomes.	Ezebilo, 2013
3	Economic Status	a. Those living in higher income areas showed more concern to the state of their environment and are more willing to pay for better environmental sanitation services	Adesope et al., 2017; Ezebilo, 2013; Adeoti & Obidi, 2010

-
- b. The higher economic status, the more the complaint to the State set environmental rules and regulations, e.g., use of waste bin for temporary storage, willingness to participate in waste recycling programmes of government.
-

Evaluation of the Findings on how the Households Waste Management affects the Transition

The Research Question Two (RQ2) looked into how the households have managed municipal solid waste that could either have contributed to hindering or aiding the transitioning process to sustainable solid waste management in Lagos, Nigeria. The evaluation of the findings is stated hereafter.

There are several ways through which some activities of households have contributed to the extant plastic waste management problems that is bedeviling the state and its occupants (Allen – Taylor, 2022; Adekomaya & Ojo, 2016). Plastic waste leakages from the value chain of solid waste management in Lagos is as a result of human errors which might be intentional or unintentional. Some households are not willing to even have the least acceptable waste storage facility or receptacle within the household dwelling. It is very obvious that such household cannot afford to temporarily store waste till the next time the PSP come to clear the waste on agreed routing days. The use of unlidded waste receptacles as earlier reported in the findings from the survey section often leads to some lightweight materials being carried away by wind when the receptacles are overfilled (See Figure 4.55).

Figure 4.55

Unlidded/over – filled with Household Waste Receptacles, Ifako – Ijaye, Lagos



Note. Self – taken photograph

Where household waste is not treated in a sustainable manner, it portends danger for the environment as indiscriminate dumping of the waste is often the next step. One of the strategies being deployed by the state government is to encourage waste sorting at source, so as to reduce the waste reaching the dumpsite. In the process, encourage plastic recycling towards plastic metabolism's loop closing. It is obvious that any household that is currently not engaged in waste sorting at source or at household level is partly contributing to the hindering of the sustainable solid waste management drive of the State. Environmental management skills or education are seemingly lacking in some household and this could be evident from the fact that most households do not even consider environmental or waste matter in their household budget (Chukwuemeka et al., 2012). Most households lack the knowledge or sufficient education on waste prevention and reduction as a means towards sustainable management of municipal solid waste (Ezeah & Roberts, 2012) as may be proposed by the authorities.

The non – compliance to existing environmental laws (Ike et al., 2018) by some Lagos Metropolis households have contributed immensely to the problems of solid waste management experienced in Lagos. There are beliefs in some quarters that it is the responsibility of the government to manage the solid waste generated in Lagos and this service is expected to be free of charge as it is considered to be one of the social provisions that the inhabitants of Nigeria should enjoy without charges. By resisting set policies of government, it is either the citizen works against the said planned initiatives or remains adamant to the call presented across through the said government programme(s). Some of these resistances to government generated – initiative in solid waste management is claimed to always stem from reactions towards the government's approaches. In most cases, the households that are one of the major stakeholders in waste generation and management are often not carried along the planning stages. The command – and – control system of municipal solid waste management does not augur well in the transition management theory. The dynamics of the system under transition is very unstable with a lot of negative feedback effects where stiff rules are applied instead of applying flexible approaches that considers the existing market instruments (cf. Tang et al., 2020; Ike et al., 2018). The command – and – control system in a democratic government sounds somehow contradictory. Formerly or through the command – and – control approach, communities and the general populace of Lagos were forced to do general clean – up on the last Saturday of every month with no vehicular movement from 7am – 10am except those on essential duties. This has been one of the ways of doing communal clean – up. But somehow along the line, the process was challenged in court and the State Government lost the case, now the general sanitation exercise is no longer enforced and most communities see no reason to continue the practice. The sanitation period used to provide avenues to even educate the populace and allowed for gradual inculcation of environmental management to the younger generation.

Unsustainable consumption by households has contributed to the extant plastic waste generation and its subsequent management problems till date. Some tenets or premises on which the circular economy concept works is to encourage sustainable production and consumption of plastic materials. The present consumption level of plastic has pushed it to reach an unsustainable state and this consumption has been mentioned as one of the singular threats to minimizing plastic pollution globally (cf. Grabiell et al., 2022). Grabiell et al. (2022) reported that as at the end of 2017, only 10% of the globally produced plastic had been recycled, while 14% of it was said to have been incinerated with the remaining 76% deposited in dumpsites, landfills and the natural environment.

The plastic waste recycling practices at some household level is one of the best steps in the right direction towards transitioning to sustainable solid waste management in Lagos. This opinion is almost a common opinion by the FGD discussants and individual interviewee from MOE & WR, LAWMA, and the plastic waste recycling officials. Oyeboade (2021) emphasized that plastic waste recycling is one of the more dynamic approaches to cushioning the adverse effect of plastic waste pollution and the depletion of the earth's finite natural resources.

Evaluation of the Findings on how the Households could be Integrated into the Value Chain of Sustainable SWM

It has been established that the ways the households manage the household generated solid waste has a way of either aiding or hindering the sought transitioning process (Section 4.5.1 and 4.5.2). The positive end of their activities could be identified and build – upon to aid the transitioning. For the negative – impacting activities, they could be identified in order to minimize such actions. Hence the section evaluated findings on how the households could be integrated in the value chain of sustainable solid waste management to play some sustainability management roles that could aid the transitioning to sustainable plastic waste management in

the study area (RQ3) through face – to – face, interviews FGDs and enhancement from literatures.

One of the identified ways that the householders could be integrated into the value chain of solid waste management chain is to properly identify stakeholders in Lagos with major influences and get them engaged in the plans for tackling the existing unsustainable solid waste management practices. The major stakeholders' heart should be won – over through subtle presentations and also given room to air their views. Their sense of belonging to the programme must be raised to the point that they take ownership of the programmes, which could lead to direct positive involvement in achieving the sustainability of the set goals of the project or policies. This suggestion on the ways forward is quite different from what is currently obtainable in the study area; where command – and – control approach by government is the order of the day. Hence, adequate stakeholders' engagements were emphasized by virtually all interviewed respondents. One of the important tenets of the Transition Management Theory and the Integrated Solid Waste Management concept is the identification of major stakeholders for projects/programmes/policy and the engagement of the identified stakeholders from planning through implementation and their possible reviews (cf. Menon & Palackal, 2021; Loorbach & Rotmans, 2007).

The importance of stakeholders' engagement/participation in an effort to intervene in a societal environmental problem cannot be over – emphasized according to many interviewees (FGDs and Individuals). The involvement of communities at the preparatory stage of the intervention programme could enhance local capacity and competence building among participants. It could help to increase and empower the negotiation abilities of the population and positively influence their further participation in a better sanitation management process for a better grass – root governance (cf. Menon & Palackal, 2021). Some prominent stakeholders in municipal solid waste management in Lagos are the State Government

machineries, the waste generators (householders, commercial premises, and industries) waste managers, waste scavengers, and recovered waste merchants. ISWM and CE concepts advocates for the integration of the stakeholders in the processes of waste management in the communities/region/states with well – elaborated roles that are clearly set – out. Most respondents were of the opinion that where and when communities are carried along the waste management processes, it can go a long way in decentralizing municipal solid waste management with its attendant benefits. Sure, multiple stakeholder participation in ISWM could help to bring out the best in individuals at the different levels in the community. Menon & Palackal (2021) asserted that where multiple stakeholders' engagement leads to partnership formation like in the partnership model in solid waste management, it could and does bring about a win – win situation. Simply put, integrating societal and economic aspects whilst environmental concerns are not left out, it will assist to transit to sustainable municipal solid waste management as corroborated in the research findings. Menon & Palackal (2021) provided a schematic representation of the matrix of stakeholders for a specific case study that could be adopted and adapted to suit the Lagos Metropolis context (Figure 4.56) knowing fully well the Lagos's socio – technical system of MSW/municipal plastic waste generation and management.

Figure 4.56

The Stakeholder Matrix for Municipal Solid Waste Management Engagement



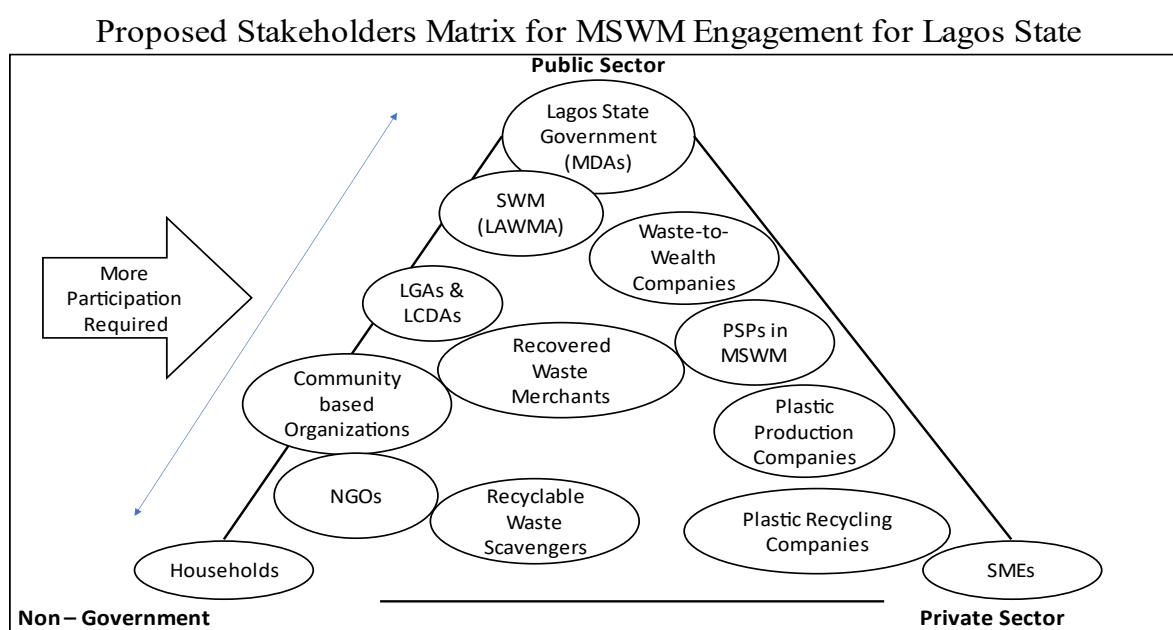
Note. Adapted from *Analysis of stakeholders' participation in municipal solid waste management – A case study*, Menon & Palackal, 2021.

Putting the Menon and Palackal (2021) model of the stakeholder's matrix of municipal solid waste management into the Lagos context, it is inferable that the stakeholder's engagement in the study area is often limited to the State government and her MDAs. As earlier mentioned, (see Sections 1.0, 4.5.2), the Lagos State Government (LSG) through MDAs are solely responsible formulation of the policy on environmental management. An interviewee from a plastic waste recycling company in Lagos claimed that, where stakeholder engagements are carried, they are usually infinitesimal and mostly after the formulation of the policy; to sensitize very few privileged stakeholders of the policy being rolled – out without the possibility of contributing to its formulation. This approach usually erodes the confidence of the populace on the policy and in most cases brings about resistance to the implementation of such policy (see Section 2.6.2). To avoid the preceding and win over the populace, massive engagement of stakeholders is highly recommended as one of the ways forward. In this regard, a generalized proposal for stakeholder engagement from the list of stakeholders

mentioned/suggested by the interviewees for sustainable solid waste management is put forward (Figure 4.57) for the Lagos State context. One of the study's findings (individual interviews and FGDs) showed that some organized estates are already practicing sustainable solid management (see Section 4.4.1). Such estates can be partnered with to share ideas on how to escalate the practice across the State. Decentralizing the stakeholder's engagement was also suggested, so that Local Government Area authorities and the communities could conveniently engage themselves with ease on their peculiarities knowing fully well the nooks and crannies of their environment and the perpetrators of most activities surrounding them.

Figure 4.57

Proposed Stakeholder Matrix for Sustainable MSWM for Lagos



Note. Adapted from *Analysis of stakeholders' participation in municipal solid waste management – A case study*, Menon & Palackal, 2021.

The stakeholder matrix could be constituted or configured to be centralized or decentralized by placing into consideration some features that are inherent with each approach. The differences between the two approaches are as tabulated (Table 4.4) by Menon & Palackal (2021, p.976).

Table 4.4

The Differences that exist between Centralization and the Decentralization of Municipal Solid Waste Treatment.

Centralized MSWM	Decentralized MSWM
It has comparatively high transportation costs	The cost of Transportation is comparatively low
Economies of scale non – adaptable to waste reduction	Local matter is a local resource adaptable to the reduction
Relatively low – quality compost	Comparatively with high – quality compost
Usually involves advanced technology	Simple technology needed in most cases
Large facility	Small facilities
High treatment cost	Low treatment cost

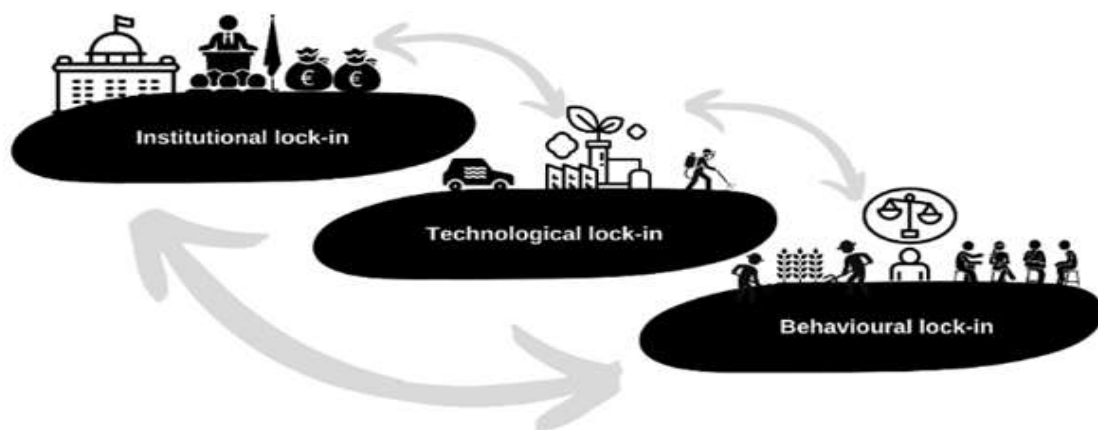
Note. Adapted from Analysis of stakeholders' participation in municipal solid waste management – A case study, Menon & Palackal, 2021, p. 976.

One of the findings of the study is that the plastic waste mismanagement is acknowledged by the major stakeholders in Lagos and the willingness to engage in a more sustainable pattern of practices is also consented to, but because the society is entangled in the web of unsustainable plastic waste management culture and wrong technology, it is becoming very difficult to change the extant practices. It was also identified that the problem arose from human factors more than other militating factors, hence, a massive re – orientation is needed to bring about behavioural change amongst the Lagos Metropolis inhabitants. Transition Management advocates for socio – cultural change that will change the pattern of doing things. The incumbent regime though based on wrong technology and practices will still stand to avoid the changes. Some respondents (FGD) were of the opinion that the wrong solid waste management practices observed in Lagos metropolis should not be looked at as an isolated matter, but as behavioural attitude entangled in wrong practices which has a strong connection with the socio

– cultural context of the community, the organizational system as well as the institutional system (Figure 4.58). Due to the existing connection, a change in any of the systems has an effect on the others: the entwining of these different systems is usually referred to as a socio – technical system (cf. Bjornavold, 2021; Iyamu, 2017). When a society is aware of a bedeviling/cofounding problem, and efforts are being made to solve the problem to no avail, as a result of resistance to change, such society is usually said to be lock – in to unsustainable socio – technical system which often leads to societal resistances to innovations. A critical discussion (FGDs) on this societal lock – in syndrome to unsustainable solid waste management practices was concluded with the understanding agreement that different approaches that could enhance societal changes needed to be applied now. That, to actually do that, we needed to understand the lock – in system and the enabling activities/elements.

Figure 4.58

How the elements interact in a lock – in Socio – technical System



Note. Adapted from *Unlocking lock-in: Accelerating socio-technical transitions to sustainability*, Bjornavold, 2021.

Critically looking at the Lagos situation as may be related to Figure 4.58, it is surmised (FGDs) that the government of the day (the elected State Governor) through her Ministries, Departments, and Agencies (MDAs) is solely responsible for the formulation of environmental

management policies. The group represents the institutional level where rules and regulations are instituted. The instituted policies determine how the industries and organizations should carry out their businesses and as such, the technologies applied and the infrastructural provisions in this regard. Where outdated or defect policies are made or remains the frameworks of operations, they give room to institutional lock – in and changing the policies to meet the globally acceptable standard becomes difficult to establish. This institutional lock – in usually allows for the application of unsustainable infrastructure and technologies in production and service delivery. Using plastic or general solid waste management practices in the study area, the individuals (households) in the society are lock – in to unsustainable solid waste management practices such as lack of effort to prevent the generation of plastic waste, indiscriminate waste dumping, non – separation of waste at source, unwillingness to pay for waste service charges, among other unfriendly environmental behaviours.

Such society locked – in to unsustainable socio – technical system could be subtly freed from the entanglement by the applications of the principles embedded in the Transition Management Theory as being used in the Netherlands (Loorbach & Rottman, 2010).

A conclusion was reached in the area of integrating the households into the municipal solid waste management in Lagos, agreeing that it is very necessary for massive enlightenment of the general populace on general practices that are globally acceptable in the waste management world. That the basics of sustainable waste management should be taught, such as waste prevention, waste reduction at source, waste sorting, waste composting, recovery, and recycling among others. The change of mindset is highly advocated for in order to inculcate the very truth about waste having value. It was claimed that incentivizing recyclables will go a long way to encourage more hands in the recycling sector. Since the fact is established that a lot of variables exists in a socio – technical system, it is often very difficult to move from one unsustainable state to a more desired sustainable one in a straight line. One of the findings

showed that, the best ways to handle such a system is to take a small positive step at a time in the desired direction in an effort to find lasting solutions to the phenomenon of concern and leaving room for flexibility. TM is a theory that believes in learning – by – doing and doing – by – learning with the aiding principle of incrementalism in a reflexive manner (cf. Kemp et al., 2007).

Evaluation of the Findings on Successful Strategies applied elsewhere to manage Plastic Waste

In this era of technology transfer, where skills, information, strategies, knowledge, among others are shared across countries, government or businesses, it will not be out of place to seek or identify strategies applied to near – similar cities or countries that have made significant progress in plastic waste management. The findings to such enquiry are here evaluated. The sum of this enquiry is for Lagos to join other success making countries that are shifting from the linear – economy of plastic materials to a circular economy of plastic production, consumption and the management of arising waste from plastic products use (cf. Babaremu, et al., 2022; Netherlands Enterprise Agency, 2021; Holland Circular Hotspot, 2020) in the Metropolis. As the research findings showed, there is a need for the creation of an enabling environment, provisional policies, sustainable government paraphernalia, enforcement mechanisms, among others to support the transition from an unsustainable Linear Economy of plastic to a more sustainable Circular Economy of plastic. The Circular Economy of a material as emphasized in the discussions is about prolonging the useful life of the material and it ensures that even after the use of the origin product, the arising waste becomes a source of material for other processes (cf. Ekins et al., 2019). It is a mimicry of the natural metabolism of a material or element, where no waste is left unused as what would have been a left – over for throw – away is used as feedstock for other processes by way of recycling of materials/elements (cf. Wautelet, 2018).

It was discussed that to tackle the continued pollution of the environment by plastic waste, there is a need to re – orient the generators of plastic waste that there is value attached to plastic waste (cf. Weckhuysen, 2020); a resource that the households could tap into and will be glad that they did. The Circular Economy of plastic is geared towards the closing of a loop of plastic material production, consumption, treatment and management of arising plastic waste. To push forward in this direction, the political will must exist in the regime of the government authorities. Sustainable policies of plastic production, consumption and management of the plastic waste must be put in place. The principles inherent in the Circular Economy of plastic material include sustainable – minded production of plastic materials, sustainable consumption of the materials, minimization of waste generation through prevention of the generation of waste, recovery of plastic, reuse of plastic materials, amongst others (cf. Mwanza et al., 2018).

For the maximization of the plastic recycling processes, it is recommended that plastic waste separation from other waste types is instituted across the State for all households to bring forth the best recyclables. Sabiini (2019) stated that waste sorting at source is a way of reducing the amount of waste meant to be discarded or reaching the dumpsite as well as making sure decent percentages of waste gets to the recycling sector and that, it is one of the fundamental steps in solid waste management. Mickael (2016) asserted that for a waste management policy to be a success on implementation, that the vast majority of the citizens would have to be involved in the sorting of waste from source and that should basically be from the household levels. To successfully achieve waste separation at household level, the majority of the households will need to have been able to containerize the household waste properly and then make room for the storage of recyclables that do not easily perish with time (cf. Fadhullah et al., 2022). The extant unsustainable practice with plastic materials must stop for a more sustainable process.

The unsustainable practices around plastic production, use, and the management of plastic waste arising from human activities have resulted in the problems observed with plastic pollutions. The extant practice is linear metabolism, which is from production to consumption and the immediate discarding of the generated waste without effort to reuse or recycle nor extend the useful life of the plastic material. The needed paradigm shifts from linear to circular economy of plastic metabolism has been proposed as a one way forward in the right direction to enable the attainment of long – time environmental protection as well as achieving better economic growth. This sustainable economy concept advocates for plastic waste up – cycling to create or generate useful products and at the same time reducing the quantities of plastic wastes that could have added to the further pollution of the environment (cf. Tulashie et al., 2022; Sabiini, 2019).

Eco – friendly techniques have been applied in some quarters to convert plastic waste to other products that their uses have been certified to be environment friendlier than the extant plastic waste management practices in the cities of most developing nations. Being an eco – friendly process gives the connotation of sustainability. If single – use plastic cannot be banned outrightly, then eco – friendly processes can be deployed to convert their waste to valuable products that can be applied in other spheres of life. Plastic wastes have been known to have been converted to products that were later used for the construction of roads in some countries such as India, the Netherlands and, Ethiopia. Plastic waste has been recycled to other liquid products in a sustainable pattern that is claimed to be beneficial to the environment with subsequent enhancement of economic growth (cf. Amankwa et al., 2021).

The most prominent plastic waste seen around the cities are plastics of packaging materials. Amankwa et al. (2021) asserted that the most global use of plastic products is basically in the sector of packaging and it is claimed that around 146 million tonnes of plastic have been produced and used in the packaging sector as at 2015 (Margret, 2023). In this regard,

they surmised that despite being the sector consuming the highest fraction of plastic products, yet most of them have a life span that is not up to one month and since there is no sustainable treatment of the waste, they end up in dumpsites, bushes, bodies of water and, drainages, among others. The adverse effects of this conventional methods of treating plastic waste, such as landfilling and incineration are very unsustainable and unfriendly environment – wise and also uneconomical. To bring to the barest minimum the quantity of plastic waste disposed in the natural environment, there is a need to embrace innovative technologies to recycle the plastics in environment – friendly ways.

One of the suggested innovative technologies is the conversion of plastic waste to products that can be used for road construction and the development of housing units and real estates. Not only will this action shrink the amount of mismanaged plastic waste, it will also relieve pressure on the demand and production of cement; a sector claimed to be contributing about 10% of atmospheric carbon footprint globally (Akinwumi et al., 2019). In so doing, there will be lesser demand for asphalt for road construction as well as other limited resources such as gravels, sand and, laterites, among others. In Ghana for instance, a company has been granted the license to make pavements from plastic waste (Amankwa et al., 2021; Akinwumi et al., 2019). It has been shown that bricks made from plastic waste and other components may contain varied percentages of plastic waste depending on what the brick is intended for. Amankwa et al. (2021) asserted that bricks purported for building housing units could contain about 70% of plastic waste and that such bricks are very strong and have high resistance to erosion. More so, the formulation of the brick requires a lesser percentage of water when compared to those made with more components of laterite. Hence, such bricks with high content of plastic waste materials reduces the pressure on water demand in building and constructions. The use of plastic waste at this level to construct affordable housing units could

make housing units to be 48% cheaper when compared to the conventional brick – buildings (Akinwumi et al., 2019).

Another innovative technology mentioned as being applied to reduce the amount of plastic waste deposited in the natural environment with their attendant adverse effects is the pyrolysis of plastic. The pyrolysis of plastic has been claimed to be a green technology for the fact that the byproduct of the process also has high calorific value that is high enough to the point that it can be used to power the plants' energy requirements. Unlike the traditional recycling that requires much of waste sorting, the pyrolysis process does not necessarily need this time – consuming and expensive sorting processes. Though, it was stated that the pyrolysis of a single plastic type will yield products of more calorific values than that of mixed plastic types. However, the constituent parts of mixed plastic wastes could be separated in the pyrolysis process by the process of selective dissolution using the understanding that plastic of different types have specific melting temperatures for a specific solvent (cf. Amankwa et al., 2021).

Evaluation of the Findings on how the Identified Strategies could be Adopted

Some of the identified strategies that have been claimed to have contributed to successes being made by some countries that is worth adopting and adapting to suit the Lagos context included the need for the State Government to institute policies on plastic Deposit Refund Scheme. This time around, the policy formulation should be based on evidence from previous studies in the same direction, to have evidence – based policies unlike the usual conventional attitude where policies are copied without adapting it to suit the affected areas. After the careful formulation of enabling policies, the plastic deposit centres have to be marked out and the designated centres should be made known to the public. The designated deposit centres should be at reasonable distances from where the targeted depositors reside or their activity areas. Bottle deposit refund schemes have been practiced long ago by some companies

in the past such as buying bottles of beer in Nigeria. It was either you bring along your empty bottles to purchase new products or you deposit some amount of money before buying fresh products and content. On returning the empty bottles, the deposited amount will be returned to the buyer. In this case, the fixing of the amount to be deposited was left at the discretion of the seller. More so, the buyer can only hope to get a refund of the deposited amount, if he/she returned the empty bottles to the same seller. The recommended type for this study should be carried out by the State Government in collaborations with the producers, and the depositing point should be made irrespective of where the plastic depositor is coming from. With a fixed price per bottle type, the scavengers could recover indiscriminately dumped plastic bottle for an assured amount at the deposit point regardless of whether they were those who originally bought the products or not.

According to some discussants, to be able to control or curtail the uncontrolled use of plastic materials, taxes have been placed on some types of plastics (cf. Walker et al., 2020). It was suggested that huge taxes should be placed on plastic that authorities needed to control its use. However, it is very pertinent that inventory of types of plastics and their most usual applications are carried out, both for locally manufactured products and those imported into the country. According to one of the FGD discussants, ‘we need to know our actual consumption before the implementation of some policies as a way of intervention, so that we are able to evaluate and monitor progress or drawbacks’.

The Lagos State and the Federal Government have mentioned and made known in some quarters their intention to place a ban on single use plastic in Nigeria (cf. FGN, 2020) and in the city of Lagos since 2021 (cf. UNIDO, 2021). However, till date, the implementation is yet to see the light of the day. A respondent dismissed the intended ban as a joke and claimed that the State Government representative who announced the ban issue was placing the cart before the horse. The correspondent asked if the Government has started producing or provided

alternative materials in the place of plastics. It was discussed that before such implementation or ban, the public should be given the opportunity or provision made available for alternative products. It may be very difficult to implement the ban where alternative products that are within the reach of all and sundry like plastic is not provided beforehand. The way the Government is going concerning the ban is usually in their character of forcing things on the people without even the Government or authorities showing a sign of preparedness on their own part (paraphrased). Such policy implementations usually die on arrival, while those in authority are not called back to explain the experienced failure or to account for funds raised to implement the failed programme. A shift from government to governance in the administration of some programmes is seen as part of the ways forward.

Transition Management advocates the need to have identified individual or societal actions that are in the innovational and sustainable development pathway, it becomes the prerogative of the authority to work with the observed sustainability initiative to steer towards perfection (Kemp et al., 2007). Plastic recycling has been one of such, presently carried out by the informal sector and the SMS companies in Lagos. Unlike the former clamour to ban the scavengers from recovering waste from the dumpsites, one of the suggested solutions is for the authorities to find how to carry along the non – formal waste management sector into the planned sustainability drive of the State government in the desired directions in that sector. For recycling to actually take – off in the right direction in a society, there is a need to institute multiple waste stream collection systems that will enable the collection of recyclables separate from other waste types (cf. OECD, 2018).

There is high a shortage of housing (deficit) in Lagos, while millions of tonnes of plastic waste are deposited in the natural environment to cause harm at the end of their useful life (Nnodim, 2022; Yalwaji, 2020). It was reported recently that the Nigeria's plastic waste has reached 1.25mt as its plastic consumption has increased by 116.26% within the last 15 years

(Nnodim, 2022). The plastic in some countries have been valorized to produce different useful products. One useful product has been successfully used for the construction of affordable housing unit. Other products from such process have been applied in the construction of the road and pavement of floors and same is suggested for Lagos (cf. Amankwa et al., 2021).

Summary

In most Nigerian families or households, the management of household municipal solid waste is usually the responsibility of the mother or adult females of the house, whom the ownership of the kitchen affairs belongs to (Viljoen, 2021). This is not to say that the women are responsible for the payment of waste services. Due to their nature of responsibilities, women are said to generate more municipal solid waste than men do. Women show more concerns for waste recycling and also consume more organic food. The gender divide has a way of influencing the possible outcome of intervention programmes in the waste management sector depending on the gender reached – out to in the process. The survey portion of the study had almost an equal number of male and female respondents; hopefully, a balanced response. Around 83.0% of the respondents were within the age bracket of 18 – 49 years and in their physical healthy states.

The behaviour of individuals is usually as a result of the attitudes towards the matter in question. The major problem with solid waste mismanagement in the study area is as a result of human maladaptive behaviours among the inhabitants of Lagos. Hence, attitudinal changes are required as ways to changing the wrong pro – environmental behaviours in order to ameliorate the problems of plastic waste mismanagement in the State. The household attitude toward household municipal solid waste management has a way of affecting the general attitude of householders towards environmental management. People from High Income areas are more organized and the housing estate showed more willingness to pay or participate in programmes geared towards the environmental well – being of the area. The same trend is

observed with compliances to government Agencies regulation on household waste containerization, waste separation at source, patronage of government – approved PSPs. These observed trends can be very helpful in pilot scheme implementation of some intervention programmes in the sustainable management of municipal solid waste. The way households treat their generated municipal waste within the household, goes a long way in contributing to general solid waste management in the State.

About 90% of the respondents agreed that municipal solid waste is generated from their households, while about 93% of them also agreed that they generate plastic waste as part of the general waste. One of the responsibilities of the households is to temporarily store the waste and give it up for collection on a weekly basis to government – approved PSPs, a service that comes with some charges at the end of the month. The unwillingness to pay for waste services charge and the non – containerization of waste by residents were found to be part of the negating factors in achieving the desired transitioning in the waste management sector in Lagos. This is most common among the Low – Income areas unlike High – Income and organized estates. The State government through LAWMA launched the ‘adopt – a – bin’ on the 23rd of February, 2022 in effort to promote the use of standardized bins within the metropolis.

That plastic waste is being heavily mismanaged in Lagos is no longer news as an overwhelming majority of respondents admitted to have observed plastic waste littering within the State and have shown concern that something drastic needed to be done to curtail it. That the Federal Government and Lagos State Government have since pronounced their intention to ban single – use plastic among other strategies to minimize the plastic pollution is a pointer to the fact that, those in power also acknowledged the nuisances arising from plastic waste mismanagement in the land.

The major method of waste storage within the household remains household waste comingling as 64% of respondents showed; the same goes with the disposal of the waste. Only about 10.4% of the respondents practice waste separation and handover the sorted waste to the appropriate authorities for recycling. Some fraction of the respondents' separate waste within the household for their personal re – use. The remaining percentage of plastic waste are either incinerated or indiscriminately dumped in the open spaces or to the State – approved dumpsites within the State.

Mismanaged plastic wastes were observed mostly at the market places where buying and selling are at their peak, other plastics were found in drainages blocking water drainages with many consequential effects.

In an effort to formulate a policy towards sustainable plastic waste management in the State, it was decried that there is paucity of information or research or inventory of various types of plastic production, importation, usage, and treatment of the generated waste in the land. Hence, most policies were formulated without adequate information, and as such, one would not expect them to be very effective for the purposes that they were formulated.

It was gathered that around 64% of respondents use plastic material on daily basis and that in the developing world, people touch more plastics than they touch their loved ones in a day. The commonest of the plastic usages are in the packaging sector. Despite the understanding of the consequences of plastic pollution, the use and mismanagement of plastic waste have continued unabated. It is inferable to say that the Lagos society is locked – in to the unsustainable socio – technical system of municipal solid waste management. To get free from this entanglement, it was suggested that the principles of Transition Management Theory could be adopted and adapted to steer the transitioning to sustainable solid waste management in Lagos. It is obvious that the extant plastic waste management like it is with other municipal solid waste is a linear metabolism of resources and virtually from all quarters, a more

sustainable practice that should involve the closing of the plastic metabolism loop is being advocated. Plastic waste recycling as advocated requires that household and other sources of municipal waste generation get involved in waste sorting at sources. To achieve the foregoing, massive advocacy is recommended to be geared toward reorientation of the Lagos inhabitants. The need for stakeholders' engagement, especially the households was greatly emphasized.

Over 90% of respondents claimed that it is the responsibility of the State Government together with the citizens to ensure the attainment of sustainable solid waste management in the State. In the State Authority's effort to get more of the citizens to be involved in the recycling of waste, the Lagos Recycling Initiative was established and a PAKAM App was introduced. It was gathered that only 24.1% of the respondents have ever heard of the PAKAM App, and out of those who claimed to have heard of the PAKAM App, only about 8.1% have used it or are using it. The foregoing is an indication that the Government effort is yet to manifest or yield quantifiable result. Considering the Transition Management Theory multi – staged developmental phases of sustainability transition, it could be inferred that the Lagos State transition stage is on the initiate state. The steering should not follow the conventional command – and – control, but a shift from Government to Governance in the administration of the transition affairs.

It is claimed that plastic waste recycling is partially ongoing in Lagos State and that only less than 10% of plastic waste generated in Lagos are being recycled. The observation showed that the recycling activities were being done by the informal sector and some few SMSs and the drive was not traced to green purpose but that the drive is to make ends meet. This act of plastic recycling at individual and SMEs level can be harnessed and steered through the application of Transition Management Theory principles to achieve long – term goals that could change the socio – technical practice in that sector, to bring about transitioning to

sustainable solid waste management using the concept of circular economy as a drive – in practice.

CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

It could be recalled that the purpose of the study was to investigate the roles that the households played in the extant plastic waste mismanagement and that which they could play to enhance sustainability transitioning in plastic waste management in the megacity of Lagos, Nigeria, through the lenses of the Circular Economy (CE) concept (Hahladakis et al., 2020; Barra et al., 2018) and the Transition Management Theory (Falcone et al., 2014) as frameworks. This chapters looked at the implications of the findings, the recommendations and conclusions arising from the mixed explanatory sequential design research.

Section 5.1 covered the implications of the findings, looking into how the limitations observed that might have affected the interpretation of the results of the study. While Section 5.2 discussed the recommendations for applications of the findings; the recommendations for future studies were stated and discussed in Section 5.3. The conclusions drawn from the study were discussed and stated in Section 5.4 of the chapter.

Implications

The implications of the findings (Lok, 2020) were discussed using the research questions as a guide. The cross – sectional survey questions were set to gather the opinions, perceptions, attitudes, beliefs, culture, and practices of the subgroups of the study populations. It was intended to see how the gathered information could be related to some existing trends toward solid waste sustainable management within the State. The study also looked at socio – economic characteristics of the study populations with respect to their socio – economic stratification of High –, Middle –, and Low – Income areas. Excerpts from the findings are discussed with respect to their possible implications.

Implications of the Findings on the Practices and Opinions of Households toward Sustainable SWM

The implications of the findings as related to the opinions, attitudes, culture, beliefs, practices that the households have/portray towards sustainable solid/plastic waste management in Lagos is discussed in this section. It is worthy to mention that the research questionnaires were set using English language. The survey questionnaires were hand – delivered and self – administered while the researcher was on the ground for any clarification where the need may arise. That the questionnaires were self – administered, is an indication that most people who have volunteered to participate in the survey are probably capable of reading and understanding English language. An analysis of the data gathered showed that the majority of the respondents attained up to the tertiary level of formal education. This was followed by those who attained up to the secondary school level of education. It is recognized that the self – administration approach would have disenfranchised those who cannot read and understand the English language despite the fact that they lived in the study area. The visually disabled residents among other related reading or speaking disabilities were not captured. On this premise, the findings can only be attributed to the educated subgroups, aged between 18 – 70 years of the stratified study areas.

The socio – economic and demographic section showed that those in High – Income areas have more of respondents that had the attainment of tertiary educational level than Middle – Income and the Middle – Income area more of the group than the Low – Income areas. Meyer (2015) stated that people with higher educational levels are observed to be more environment – friendly and that education has a way of impacting on how individual get concerned towards their social welfare. Hence, a more educated individual is expected to be more environmentally – friendly as his/her concerns for their social welfare is increased and this is expected to make them behave in manners that are more environmentally – friendly. Knowing the state of mind

of the different dwellings toward the environment by way of knowing the information flows is very important (cf. de Lange et al., 2019). Before an environmental intervention for a particular community, knowing their opinions, perceptions, among others, makes it easier in terms of community engagement approaches (cf. Adams and Sherar, 2018) and enhances one's ability to converse with the community (cf. Nyadoi, 2020). The Transition Management Theory advocates that the managers of the transition should work with observed sustainability initiatives to steer the transition process in the desired sustainability direction for the benefit of all (Kemp et al., 2007). In plastic circularity – thinking, individuals and the informal sectors are championing the plastic recycling activities in Lagos, Nigeria as this study noticed (cf. Ogwueleka and Naveen, 2021; Nzeadibe & Iwuoha, 2008). With the knowledge of this trend, intervention programmers would have known what each settlement has and how to improve on the existing sustainable initiative or provide that which is lacking.

The High – Income areas are often more organized than other socio – economic strata. They often have strong residents' associations that normally have set rules and regulations that every potential landlord or resident have to follow and, in most cases, environmental management is often times emphasized. Living around such an environment is claimed to have a positive effect on the individual's pro – environment behaviours (cf. Lewis, 2020). Halpenny (2005), surmised that, where an individual is attached to, has effect on his/her pro – environment behaviour. For those who have already imbibed the good culture of environment management, it will not be wise for the authorities to lay more emphasis on environmental management re – orientation by way of environmental management advocacy. Such advocacy will be focused on Low – Income area dwellers who seemed to be less concerned with their state of the environment.

It is worthy of mentioning that those in Low – Income areas have more room system for dwelling and the dwelling units are inhabited by more householders than those of Middle –

Income and High – Income. The LI areas as usual are more densely populated than the HI and MI areas. This could inform government on the type of intervention programmes to be made available according to the peculiarity of the areas. Hence, intervention planned for communities with high population densities should not use only the physical sizes of the dwellings but must consider the population sizes for judging the infrastructural provisions.

About 85% of the respondents acknowledged that they generate municipal solid waste as a result of householder's activities while 10% claimed that the households do not generate municipal solid waste and the remaining could not be certain whether they generate waste at the household level or not. Dikole & Letshwenyo (2020), asserted that human activities lead to the generation of waste of different waste types, which will necessitate the handling of waste, waste storage and treatment where possible, by way of waste collection, transportation and, disposal among others. In a situation where about 10% of respondents claimed that their household does not generate waste may connote a lot that might not go well with the desire to transit to a more sustainable solid waste management in the State.

The State Government requires all households to have a standard means of temporarily storing waste within/around the household. LAWMA recommended waste storage receptacles/bin (240 litres capacity) with lids, unfortunately, different waste storage receptacles are being deployed by different households. Some do not have lids; others are even too small to contain a week – long household waste. About 7% of the respondents claimed they do not have temporary waste storage receptacles within the household dwelling units and such households will definitely have ways of disposing the waste after generation. In most cases, such households dispose of their waste in open spaces, bushes, roadsides, drainage channels, illegal communal dumpsites among others. It is stated that, no matter how good a solid waste management plan may seem, the strategy will run into problems when the majority of the waste generators refuses to allow the authorized waste collectors to pick their waste. It is common

within the metropolis to see waste receptacles without lids and some of the light wastes littering the ground even when the receptacles are not yet filled – up. The inculcation of the culture of proper inhouse waste keeping in accordance to the provisions of the Lagos State Environmental Law is seen as a necessity towards sustainable SWM in the study area.

Household generation of plastic waste were acknowledged by an overwhelming number of respondents, and the nuisances arising from plastic waste mismanagement within the metropolis was equally acknowledged. The need for drastic actions to curtail the ever – rising trend of plastic waste generation and mismanagement have also been shown by the majority of the respondents. The authority has shown concerns and several efforts have been put in place to curtail the nuisances, yet, it seemed not to have yielded any tangible results. This could be an indication that the processes used in the intervention programmes may be wrong or some very essential aspects are missing and this needed to be deciphered in order to achieve the desired goals of the interventions. Such persistent environmental problems resulting from unsustainable socio – cultural practices, though acknowledged to be wrong, yet the society continued in the practices is a pointer that the society is lock – in or entangled to the unsustainable practices (cf. Rotmans and Loorbach, 2009). The society could be said to be lock – in to unsustainable socio – technical culture of a complex and wicked environmental problem that are characterized by a high level of uncertainty, unstableness, lots of feedback effects, with lots of disagreements on values and varied conflicts (Duckett et al., 2016; Akamani et al., 2016; Balint et al., 2011). Usually, such wicked environmental problems are so named because there is lack in consensus with regards to their scientific definition and the solutions have no straight path (Akamani et al., 2016). This will require for the Authorities to reflexively re – strategize on the approaches deployed so far, for a change.

Waste separation at the household level is still at the abysmal level in the metropolis as only 9% of the respondents practice the separation of plastic waste from other waste types for

recyclers to pick. The desire of the Government in power in the Lagos metropolis is to transit from the conventional linear metabolism of plastic use to the Circular Economy of plastic through loop – closing (Kadiri, 2022). About 13% of the respondents claimed they separate or set aside plastic waste that they can reuse personally. OECD (2018) reported that, despite the fact that several efforts have been made to improve the plastic recycling sector, yet the activities around that sector could be classified to be economically marginal and that at the global level, the plastic recycling rate remains between 14 – 18%, while between 58 – 62% of plastic wastes are disposed – off and the remaining 24% are incinerated. The finding also showed that over 64% of the respondents commingle the generated waste from the household. To return such waste to the circular loop of plastic waste management, the comingled plastic waste will have to be recovered either by scavengers or at the material recovery facilities. These recovery processes have cost implications and the recovered plastic because of contamination with other materials will have to be specially treated before use, though that will depend on what its reuse is slated for. Using commingled plastic waste in recycling processes reduced the recycling efficiency of the process according to Hahladakis et al., 2018. Waste separation at source is a necessity to achieving sustainable solid waste management (cf. Onyango et. Al., 2024).

About 95% of the respondents claimed to have seen plastic waste littering within the environment of the metropolis and a near similar percentage claimed they have used plastic materials, with around 64% of them using plastic on daily basis. About 39% of the respondents said they buy plastic products or products that have plastic parts on daily basis, while about 40% do that on weekly basis. Bearing in mind that there is bound to be economic and social implications of placing a ban on single – use plastics (Phillips et al., 2020) without alternative material(s) to plastic being put in place, it might be difficult to place a ban on single – use plastic and succeed in Lagos State.

An overwhelming percentage of the respondents claimed to be aware of the environmental problems associated with plastic waste mismanagement, and acknowledged that plastic waste has some economic values. About 81% of the respondents agreed that plastic waste scavenging should be encouraged and also agreed that the observed littering is not acceptable; that something should be done to curtail the trend. Yet, the plastic use and subsequent leakages of the arising waste has continued unabated. This type of social environmental problem can be said to fall along the complex and wicked environmental problems (cf. Bierbaum et al., 2018; Kirschke & Newig, 2017).

Plastic waste recycling is highly advocated for as one of the ways forward for developing nations, where stringent measures do not exist for the regulation of plastic production, use and management (Babayemi et al., 2018). Around 76% of the respondents claimed that they practiced the reuse of some plastic materials within the household level. The official introduction of plastic reuse should not pose problems since it has been a volitional old practice, but doing so with both the desired plastics waste for reuse and other plastics that the users do not reckon to be useful for their personal needs might be difficult. It should be borne in mind that the reuse of plastic waste as practiced locally is not basically as a result of circular economy thinking or for the reduction of plastic waste but for personal sake and self – satisfaction. For instance, more than 50% of respondents claimed they never made any intentional/personal effort to minimize waste generation or reduce plastic waste volume at source. However, that plastic waste has been reused by individuals could be capitalized to institute plastic re-use in the State.

For those who claimed they do not separate waste from source or within the household level, several reasons were given for not doing so. Among the reasons given were that; no known law in State mandated that waste should be separated at household level, others saw no reason why they should separate plastic from other waste, while others said households had

only one waste bin, while others stated that waste separation is cumbersome with an extra cost attached. A small fraction also claimed that they do not know where to sell the segregated waste. It is inferable at this juncture, that the policy and necessary information that could help the populace to participate in activities to transit to sustainable plastic waste management is seemingly lacking and that the authorities need to create an enabling environment to steer the needed transitioning in the right direction.

The willingness to participate in sustainable management of solid/plastic waste showed that over 92% of the respondents indicated that they are willing to participate while around 6% said they are not willing to participate; approximately 2% of the respondents were indifferent in the matter. A similar trend was indicated for the willingness to participate in plastic waste recycling, should the State Government advocate for all individuals to participate in plastic waste recycling. There is a high level of the willingness to participate in household plastic waste sorting. The willingness is a good sign to direct any intervention programme. The few indications of unwillingness to participate were more from the LI areas than in MI and HI areas progressively. It must be understood that the tendency for resistance to instituted waste separations at source should be expected more from the Low – Income households.

The findings also showed that over 90% of the respondents are of the belief that it is the combined responsibility of the Lagos inhabitants and the government in power to ensure that plastic waste is sustainably managed. The acknowledgement of the fact that it is the responsibility of government and the citizens to ensure that sustainable plastic waste is instituted could be an indication of what the authorities need to succeed in the fight against plastic pollution is the implementation of the right policy framework (cf. Villarin, 2020; Jambeck et al., 2015).

The Lagos State Government has indicated her intentions to place a ban on single – use plastic materials and the findings on this matter revealed that over 61% of the respondents

showed willingness to comply, should the ban be placed. About 26% of the respondents claimed they will not comply with any of such directive(s) while about 13% were not sure whether they will comply or not. These set of respondents that claimed they will not comply and those that were indifferent might end up frustrating the course of action. More so, over 46% of the respondents claimed they cannot do without the use of plastic in their regular daily activities, while about 13% were indifferent on the matter. These groups of stakeholders must be approached with caution to help steer the ban to be acceptable to the majority with the hope to have a softer landing when the time arrives. However, about 41% of the respondents think it is possible to manage life when a ban on single – use plastic is placed in Lagos State. The LI and low educated respondents seemed to show higher resistance to the ban. The regulatory Authorities will need to strategize with the consideration of the socio – economic levels of the different communities in order to achieve considerable success.

The State's government – approved waste collectors from the residents are the PSPs that are assigned to different slots. One of the findings showed that around 76% of the respondents dispose of their household waste through the PSPs, the remaining respondents will therefore dispose their waste through other channels, which are recognized to be illegal in the State. For instance, about 14% of respondents claimed they dump their generated waste in public places/space, around 8% claimed that they patronize cart pushers in the disposal of theirs (see Figure 5.1). The cart – pushers collect municipal waste from house – to – house for some tokens of Naira, and since they cannot dump the waste at the approved dumpsites, they often dump the waste on open spaces usually not far from the neighbourhood, contributing to the waste leakages. The activities of the cart pushers in this regard are counterproductive with the State Government efforts towards achieving a cleaner Lagos. It comes at a cost to Lagos State Government. The cart pushers collect money from the householders, dump the waste in the neighbourhood on public places, LAWMA will spend money to remove this waste from public

places almost on a daily basis. The waste generators who patronize illegal cart pusher to dispose of their household waste, may be doing so for reasons like, unwillingness to pay the fixed bulk of monthly charges by the approved PSPs unlike the cart pusher that do pay – as – you – go. The householders pay at the point of carting the waste after negotiation for every waste to be carted. Others may be doing so because the PSP assigned to their community is not regular as agreed. Still, other may be willing to pay to the approved PSP assigned to the area, but for lack of fund, they end up being indebted to the PSP, leading to the refusal of the PSP to cart their household waste. Subsequently, illegal dumping becomes the easier options for the payment defaulters.

Figure 5.1

Photos showing the Cart Pusher Activities in Lagos Metropolis



In an effort to curb their activities, the government is spending resources to arrest their unfriendly activities (Figure 5.2) while about 2% burn their waste and only about 1% practice waste composting. LAWMA enforcement team have been arresting them, ceasing the cart and dismantling them. However, the Discussants in one of the FGDs were not satisfied with the action on the ground that those who patronize the cart pusher are not prosecuted along with them as was done in the past. Prosecuting the clients along with cart pushers did work out well in Lagos until the ‘Cleaner Lagos Initiative’ was established August, 2016, by executive order. The implementation was a failure in a policy summersault brouhaha that undermined the previous

achievements on waste management in Lagos and resulted in a drawback, re- proliferation of cart pusher.

Figure 5.2

LAWMA Enforcement Team Arrest Cart-pushers and Impound Carts



Approximately 19% of respondents, mostly from LI areas do not pay for waste service but somehow, they do dispose – off their waste. So long as there are residents who are not willing to pay for waste service, the likelihood of indiscriminate waste dumping in public places will continue (Figure 5.3).

Figure 5.3

Indiscriminate Solid Waste Dumping within the Metropolis



The results of inquiry into the PAKAM App and its application showed that approximately 73% of the respondents never heard of the PAKAM App despite the fact that it was introduced to the recycling sector since mid – 2021. Meanwhile, only about 24% of respondents claimed they have heard of PAKAM App for plastic waste recycling in the State. However, only 8% of those that have heard of PAKAM App have used it for recycling purposes. Since about 92% of respondents who heard of it never used, it is inferable that the PAKAM App popularity is very low and a lot needed to be done to persuade the inhabitants of Lagos to use the App to assist them in participating in the Lagos Recycling Initiative (LRI).

Implications of Findings on how the Households Waste Management affects the Transition

The concern of this section is to discuss the implication of the findings on how the households managed municipal solid waste that could either have contributed to hindering or aiding the transitioning process to sustainable solid waste management in Lagos, Nigeria.

One the findings showed that the activities of householders do lead to the generation of different types of waste and that how the generated waste is initially handled at the household level contributes to the general waste management state of the area (cf. Ayeleru, 2021). Households are acclaimed to be the highest generators of municipal solid waste in developing nations. It was gathered that some of their expected responsibilities in the value chain of solid waste management as a generator of waste in Lagos State include the following: (a) to temporarily store the generated waste in a waste receptacle for storage within the dwelling until it is due for collection by Government – approved PSP, (b) to patronize only the Government – approved PSPs by handing the waste over to them, (c) endeavour to pay for the waste service charges when the bills are distributed, (d) monitor and report the assigned PSP to the Authorities for any form of irregularities (cf. LASG, 2017). In corroboration with USEPA, 2020, some interviewees emphasized that for a successful solid waste management strategy, a

robust solid waste collection system must be put in place. LAWMA's pressing concerns seems to be the collection of waste from generators and the picking of waste indiscriminately dumped in public places almost on daily basis. Some of these indiscriminate waste dumping within the metropolis is perpetrated by those who do not want to pay for waste service charges. Those residents who do not want to pay for waste service charge will definitely find ways through which they will dispose the waste and it is likely to be an illegal means. Such individuals will likely be part of those that will contribute to the hindering of the transition process, as such people use the cover of the night to dump waste at public places (Figure 5.4).

Apart from not wanting to pay for waste service charges that leads to indiscriminate dumping, some households have waste receptacles that are far below the capacity to withstand the household waste for one week based on the weekly collection plan for residential waste. In such a situation, whether household is patronizing Government – approved PSP or not, the filled household waste receptacle has to be emptied, contributing to the leakages of waste into the public places. The waste management set – up and practices are far from the globally acceptable solid waste management practices. From the findings on the introduction and use of PAKAM App meant to stimulate the involvement of the general populace to embrace plastic waste recycling, it is inferable that the State Government efforts to improve on the plastic recycling rate has not yielded any significant result. The transition could be said to be at the abysmal stage. This finding could be harnessed by the intervening authorities, to decide the areas to focus on in the intervention programmes.

It is worthy of mentioning that some households, especially those in High – Income and well – organized estates are known to carry – out waste sorting at the household levels and even dispose of the sorted waste into recommended waste banks for further processing of the recyclables. Such estates are exemplary estates that their waste management practices are worthy of emulating as it could be seen to contribute positively to the transitioning drives.

Implications of Findings on how the Households could be Integrated into the Value

Chain of Sustainable SWM

How can the households be integrated in the value chain of solid waste management to play some sustainability management roles that could aid transitioning to sustainable plastic waste management in the study area?

One of the findings revealed that intervening government agencies do not carry the households along as the major stakeholders in the planning of intervention programmes on municipal solid waste management. There is no adequate stakeholder's engagement in planning towards measures to minimize solid waste leakages along the management line (cf. USEPA, 2020; Adongo et al., 2015). Without engagement of the citizens for their opinions, it is usual for the Government to rollout initiatives or implement waste management policies expecting the citizens to comply with. Such command – and – control approach usually bring about discord between the Government and the governed. The governed will assume that the Government do not care about their opinions in the matter and may decide not to comply with such directives; thereby deepening the waste pollution situation.

The households been major stakeholders in solid waste management needed to be integrated into the solid waste management plans of the State, from planning to implementation as well as the monitoring and evaluation where the need arises. Multiple stakeholders' engagement is highly needed to reach the populace, get them involved and to take the programme as theirs with high sense of belonging. Integrated Solid Waste Management approach that is recommended for developing nation advocate for massive stakeholders' engagement to win over the majority of stakeholders. The roles of every stakeholder should be clearly spelt out and convinced to comply without much need for enforcement. If the households refuse to give their household waste to the assigned PSPs, then the entire waste management plans will be a flop. To have a successful waste management process, the waste has to be collected first by the assigned PSPs. The main focus of LAWMA has been the

collection of the waste from house – to – house and commercial premises by the PSPs while the indiscriminately dumped refuses at public places are carted away by LAWMA's Community Cleanup Unit (CCU). The waste leakages observed in Lagos State are as a result of human factors, therefore, it is necessary that the society needed to be re – oriented to be more environment friendly in their daily activities.

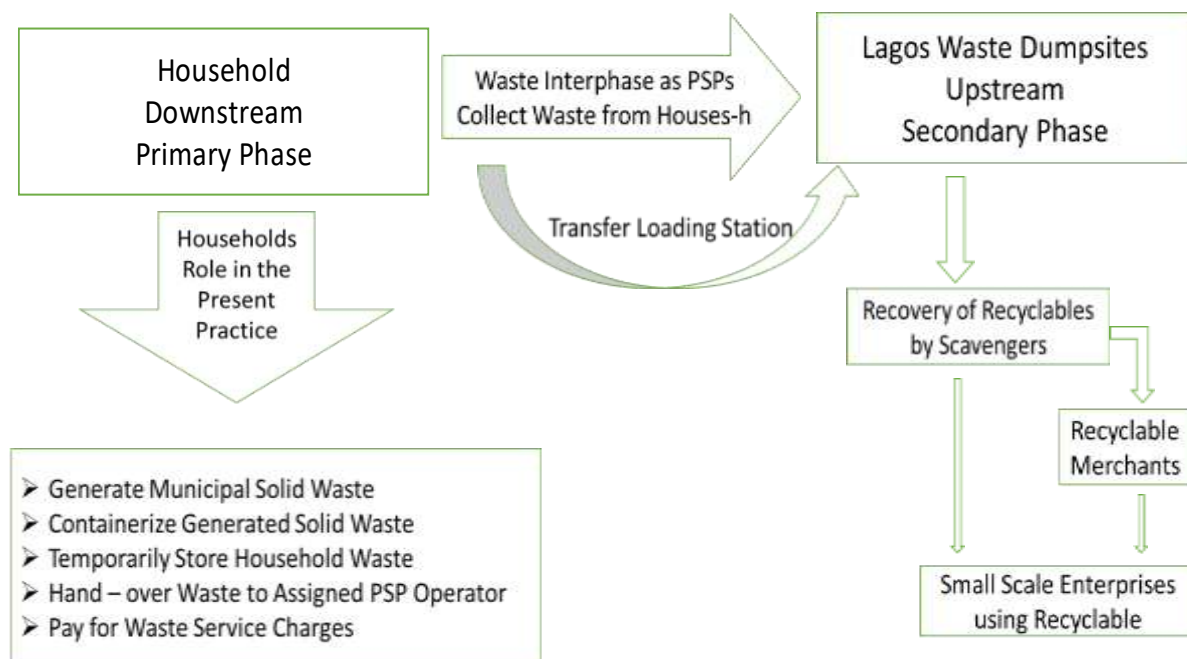
The more environment – friendly ways of attending to plastic waste management issue will not only focus on plastic waste recycling as the buzz word for the way forward, but will have to consider the prevention of waste generation among others. Following the sustainable solid waste management hierarchy concept used in prioritizing how waste should be better managed, advocates that waste prevention should be given the highest priority (see, Section 2.3.3; Figure 2.5). Recycling which usually takes place after the end – of – life of the product's use phase is on the third rung (priority list) of the sustainable waste management hierarchy or ladder. Recycling according to Bartl (2014), from available evidence seems to only tackle the symptom of the problem rather than the causes as it contributes to the reduction in the use of virgin infinite resources. On the other hand, waste prevention and the proceeding priority of 're – use' usually take place before the primary end – of – life of the product is capable of handling the cause of the existing waste problem. The prevalent practice is more of a direct flow from waste generator (downstream) to the dumpsite through the PSP as shown in Figure 5.4. As currently being practiced by the larger society, the PSPs stand as interphase between the downstream municipal solid waste management phase and the upstream phase along the value chain of solid waste management. At the downstream phase, the households generate solid, containerize the waste that is largely comingled, temporarily store the waste around the household dwelling unit pending on when the assigned PSP comes to collect the waste (usually on weekly bases) according to agreed times of collection. The households are expected to pay for waste service charges as service recipient. The regular pay by the service recipients is very

important as it contributes to the sustenance of the PSPs' business, which in turn contributes to the prompt carting of waste from households, hence a better general state of the environment. However, this practice does not meet the globally acceptable solid waste management practice as it is unsustainable. The major drive in this regard is focused on the aesthetics and health concerns, while neglecting environmental protection, the social equity, and the economic aspect as advocated by the Sustainable Development concept from which the Circular Economy concept was derived (cf. Ferronato & Torretta, 2019).

Figure 5.4

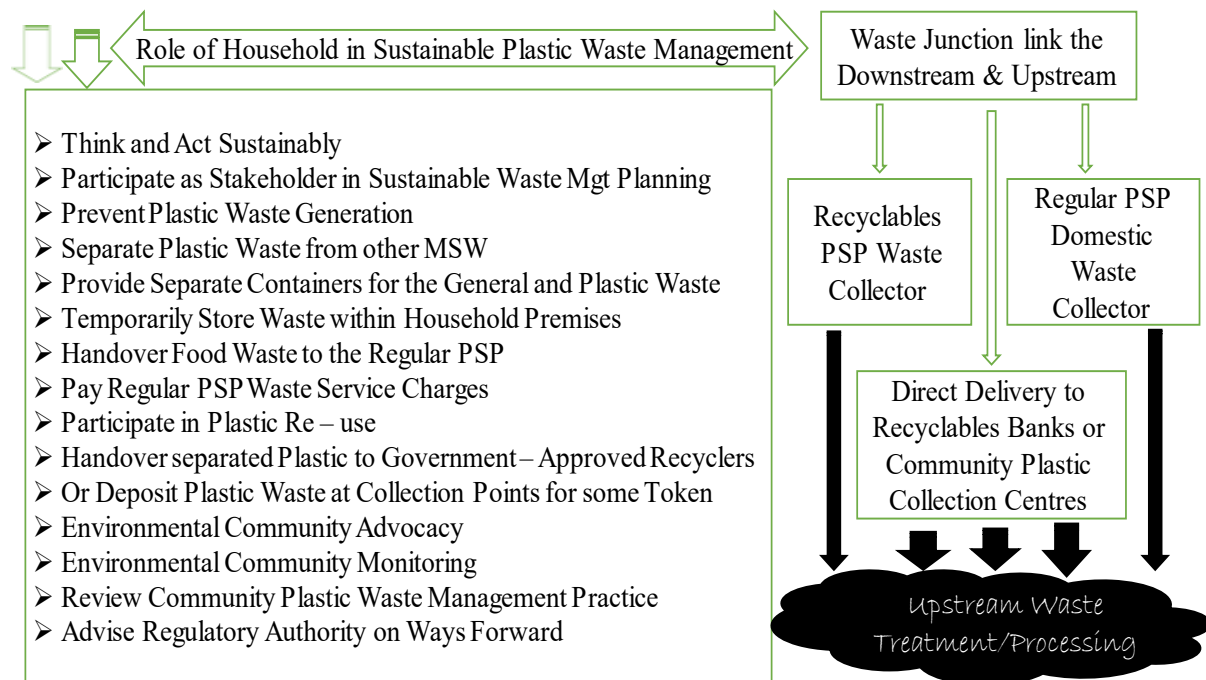
Extant Official Flow of Household Solid Waste in Lagos Metropolis

The Official Flow of Solid Waste in Extant Solid Waste Management and the Role Played by the Households in Lagos



Note. Self - developed

The premise on which the Circular Economy concept stands is different from the extant solid waste management practice that is prevalent in the study area. A shift from the extant practice to the sought sustainable management practices will mean an increase in the role of the households (Figure 5.5).

Figure 5.5*Expected Roles of Households in Sustainable Solid Waste Management Situation***Households' Roles in a Circular – Economy – Minded Solid Waste Management Situation**

Note. Self - developed

It will also mean a change in the behaviour, culture of handling waste, perception, practices, among others. Apart from the aforementioned roles played by the households in the extant solid waste management practices, in the situation of the Circular Economy – minded practices, the additional roles of the households will include a total re – orientation that will concern sustainability thinking, acting, and consumptions. The households playing the role of a major stakeholder in municipal plastic waste generation will have to participate in the policy formulation stages for sustainable solid waste management in the State (Farrah & Ng'ang'a, 2022). Since the formulated policy will inculcate the tenets advocated by the Circular Economy concepts, the households in that dispensation will have to make concerted efforts to prevent the generation of plastic waste as much as it is within their capabilities. Where the plastic wastes are unavoidably generated, it has to be separated from the other municipal solid waste for a more sustainable management. This gesture will contribute to increasing the

recycling activities in the State and the recycling efficiencies of the recycling processes when compared to recycling using contaminated plastic waste from comingled household wastes or recovered waste from dumpsites. To effectively separate plastic waste from other waste types, there will be need for the provision of receptacles for plastic waste or household separated recyclables as clamoured by LAWMA. Then, instead of the conventional handing over of comingled waste to the regular PSPs, arrangement will be further made on how the separated plastic waste will get to the solid waste management junctions. In this context, waste junctions act as the link or interphase between the downstream phase and the upstream phase of the value chain of solid waste management. It is either the plastic is handed over to LAWMA agents that cart recyclable or the plastics are taken to the waste banks within the neighbourhood.

Transition Management Theory advocates that the identified individuals or small groups' innovations should be encouraged and steered towards the right direction. As observed and also claimed, the majority of the recycling of plastic in Lagos is carried out by the informal sector in waste management and few Small and Medium Enterprises (cf. Nzeadibe et al., 2010).

The majority of households in Lagos co – mingle their household waste and when the waste is handed over to the PSPs, they transport the waste to Government – designated dumpsites where the wastes are disposed. The waste scavengers at the dumpsites are the ones who recover recyclables from the dumpsites and sell to the recyclable merchants, that in turn sell to SMEs for recycling. The activities of the scavengers are still been considered as illegal and they do face lot of harassment from government officials. But as long as waste is being co – mingled in Lagos, the scavengers will continue to be relevant in the drive toward transitioning to sustainable plastic waste management in the State. Instead of treating the scavengers' activities as illegal, the government should rather find ways to integrate them to the formal waste management line and create a better enabling environment for their work. However, some discussants pointed out that several State Administrations have made efforts to integrate

the scavengers into the formal sector of SWM without tangible success till date. It was also mentioned that the present Administration in Lagos is not sleeping on the matter.

Implication of Findings on Successful Strategies applied elsewhere to manage Plastic Waste

Some strategies have been identified that have been successfully applied for some other megacities/countries of near – similar characteristics with Lagos in the management of plastic waste. The implications of the findings are here looked at and discussed.

One of the findings showed that the most common options currently being used to minimize plastic waste nuisance and maximize the economic value inherent with plastic waste is the adoption of the Circular Economy of plastic products. This concept does not only look at post – consumer phase of the products but also consider and ensures that even during production, sustainability or the recyclability of the products must be considered (cf. Garcia & Raes, 2021). This also implies that the consumers of the products must also think sustainability in their consumptions. The line of production of the plastic in Nigeria will be changed so that those chemicals that are added to the products that make them less recyclable will have to give way or will be minimized (cf. Hahladakis et al., 2020; Hahladakis & Iacovidou, 2018). For successful implementation of the Circular Economy of plastic, the protagonists of the CE concept advocates that plastic waste separation must be instituted with the majority of the citizens or households getting involved and playing their roles accordingly. Hence, the recycling rate needed to be increased to a high level as corroborated by Babaremu et al., 2022 and Maitlo et al., 2022.

In their efforts to minimize the nuisance constituted by plastic waste in the nation, the Federal Government and Lagos State government have at different time indicated their intentions to place ban on single – use plastic or plastic bags (Ajoku & Okoro, 2020; Olasukunmi, 2020) as have been done in Zanzibar Island, Kenya, Rwanda, among other places

(Bezerraa et al., 2021). It is expected that a ban on plastic bag use or single – use plastic will reduce the consumption of plastic waste drastically, minimize leakages and the pollutions arising from plastic waste mismanagement. Countries that have successfully implemented the ban on single – use plastic claimed to have observed significant drop in plastic consumption as well as drop in the level of plastic littering and the reputation of such countries are enhanced. The ban could also help to increase request for better sustainable options for the replacement of the ban of single – use plastics (cf. Pilapitiya & Ratnayake, 2024; Think180, 2020).

A ban on single – use plastic in Lagos according to some respondents will likely have great effect on the plastic industries scattered across the state. It also means that alternative to single – use plastics will have to be made available and it might not be easy enumerating the possible hardship that it may cost the Low – Income citizens (cf. Turpie et al., 2019).

It was suggested that, when it is realized that outright banning of single – use or plastic bag will bring about untold hardship to the already economically battered society, then a softer measure of taxing could be placed on the use of such plastics as may be identified (cf. Desalegn & Tangl, 2022). If placed, it will help in reducing the use of such plastic and at the same time reduce the amount of plastic consumption and the generation of plastic waste, hence reduction in littering by mismanaged plastic waste.

In a similar vein, Plastic Deposit Refund Scheme (DRS) could be instituted with highly publicized designated collection centres. This approach should be geared towards reduction in the pollution arising from plastic use and its waste management through application of DRS. DRS allows for some fixed price to be placed on such identified plastic containers and also, help to curtail their leakages. For the fact that some amount is deposited during the purchase of the product(s), with the understanding that when the empty containers are returned, the deposited amount will be paid back, it discourages the consumer not to indiscriminately throw – away such empty containers after the product's end of life. It is one of the tools used in

circular economy thinking for the sustainable management of product – end – of – life and to increase recyclables and recycling rates (cf. Garcia & Raes, 2021; Snowden, 2019). DRS is part of a detailed Extended Producers Responsibility (Yuen et al., 2019).

One of the findings showed that the institution of plastic Extended Producer Responsibility (EPR) is to curb plastic waste leakages as well as the reduction of littering. EPR institution is geared towards ensuring that the manufacturers of so – selected products are partly responsible (financially) for the waste arising from the end – of – life of their product(s) (post – consumer concerned). These responsibilities can come at different stages which may make the producer to be involved in take – back schemes, where stated, recycling and possible disposal at the end of it all or end of the useful life (cf. Yuen et al., 2021).

Implications of the Findings of how the Identified Strategies could be Adopted

Several initiatives that have been applied by some nations to tackle the menaces resulting from the use of plastic products and the mismanagement of the arising plastic waste that could be adopted and adapted to suit the Lagos context were identified in Chapter 4 (Section 4.4.3). Some of these included the institution of Extended Producer Responsibility (EPR) with embedded plastic Deposit Refund Scheme (DRS). In order to achieve more plastic circularity, there is need to up – scale the level of plastic waste recycling by improving urban plastic waste harvest. If for any reason, the plastic waste product is not recyclable, then it should be used in plastic waste – to – energy projects rather than being buried at the dumpsites.

The adoption of Extended Producer Responsibility in Lagos will mean that any company or producers that her products are enlisted in the programme will have to, be financially committed and be somehow responsible for the products sent out to the market up to the post – consumer stage of the product(s) (cf. Allen – Taylor, 2022; Johannes et al., 2021). Allen – Taylor (2022) mentioned that the Federal Government of Nigeria through her agency, the National Environmental Standards and Regulations Enforcement Agency – NESREA

(FGN, 2016) in 2014 adopted and implemented the EPR policy in Nigeria. They further stated that it is however quite unfortunate that till date, none of the States have adopted the EPR in their efforts to manage the environmental problems facing them. They also proposed that Lagos State should combine EPR and the Deposit Refund Scheme in order to curtail the growing problems arising from plastic waste mismanagement in the State.

Implication of Findings from Solid Waste Management Associations of Study Area

On households generate municipal solid waste, one of the findings showed that households in low socio – economic stratum are less likely to generate municipal solid waste than those households in high socio – economic stratum. More so, there is a significant positive correlation ($N=217$) between household solid waste generation and the nature of dwelling ($\tau = 0.030, p < 0.05$). To be able to make necessary evidence – based decisions toward sustainable management of the solid waste, it is paramount that basic information concerning waste generation in various parts of the city is known. Waste generation and even the characteristics of municipal solid waste differs from region to region, even in the same city. Quantity of waste generation is a function of socio – economic development and population; any reasonable intervention programmes must put such information into consideration (cf. UN-Habitat, 2018; UN-Habitat, 2010). The usual approach in the study area is more of universal style or one size fitting all situations, irrespective of socio – economic status of dwelling area, nature of residence, population density, nature of dwelling units, among others.

Households' temporary storage of household generated waste was observed to significantly increase with socio – economic status ($p < 0.05$) and with nature of dwelling. It is clear that households in low nature of dwelling, in low socio – economic stratum are less likely to temporarily store household generated solid waste than those from high nature of dwelling units, in high socio – economic areas. Figure 4.52 showed that the percentage of household without temporary waste storage facility within the dwelling units is highest in the low –

economic areas. Temporary storage of household waste is a necessary process that allows for organized waste collection system. Where temporary waste storage is lacking, the possibility of indiscriminate waste dumping in public places will be high (cf. Nnaji et al., 2021). It is observable that most slum dweller and some low – income area dwellers in Lagos do not have temporary waste storage facility, hence do not hand their household waste to Government – approved waste collector and as such, do not pay for waste carting services, but throw – away the waste as they see fit. Such activities are at great cost to the environment, human, and to the government that will have to pay labour to gather such waste and transfer to compactors in the moping of indiscriminate dumped refuses in public places in the city. These indiscriminate dumping of waste contributes heavily to the leakage of plastic waste from the value chain of solid waste management in Lagos, leading to the observed plastic waste littering. Patterning to the acknowledgement of the littering, the finding showed that the lowly educated households, in Lagos Central District, in middle – income stratum are less likely to agree that littering is not good than those highly educated, in Lagos East District in the high economic stratum. In planning to massively educate the populace on plastic waste mismanagement and its adverse effects, concentration should be more focused on the low – income areas than the high – income areas.

The result for the need to better manage plastic waste than the existing practice was highly agreed to. Need to better manage plastic waste significantly increased with increasing educational level ($p < 0.05$). Need to better manage plastic waste was however significantly irregular with residential area ($p < 0.05$). Across the three Districts of Lagos East, West, and Central areas, there was irregularity on the need to better manage plastic; the reason might not be far from the fact that each of the districts have visible socio – economic strata of dwelling and people of different mindsets. These different mindsets have to be considered in planning to execute a better or sustainable management programmes across the State. But since the

majority of the respondents agreed that it is time for necessary actions to be put in place to curtail the trend of plastic waste mismanagement, it is a good indicator for necessary interventions to be implemented. Such agreements could aid the acceptance of plastic mismanagement intervention; this coupled to the fact the overwhelming majority of the respondents indicated that there are inherent economic values in plastic waste materials. More people are presently getting involved in plastic waste recovery than ever and this continued increase in plastic waste recovery, reuse, and recycling is a plus for the advocated circular economy of plastic material (cf. Calleja, 2019).

One of findings showed that effort to reduce plastic waste generation increased with increasing educational level and socio – economic status. The female respondents in low economic stratum are less likely to make effort to reduce plastic generation than the male respondents in high economic stratum. One of the present understandings in solid waste management is to prevent the generation of waste. But with over 50% of the respondents claiming that they never made any personal effort to reduce plastic waste generation (see Figure 4.24) could be an indication that a lot needed to be done to change the mindset of the Lagos residents in order to aid the transiting to the circular economy of plastic being sought after. The prevention of waste generation is one of the most advocated management strategies in the solid waste management ladder/hierarchy (cf. Allen-Taylor, 2022). Any planned intervention programme geared toward establishing sustainable management of plastic waste and other waste types will definitely need to lay emphasis on the prevention of waste generation. Waste recycling is at the third rung of the priority or preferred waste treatment in the waste management hierarchy, and plastic recycling is at its best when the plastics wastes are not contaminated through comingling with other waste types. However, waste sorting or segregation at source in the study population is at abysmal level. The more educated respondents indicated more practice of plastic waste separation at household level, which might

necessitate aggressive enlightenment of the populace to gear toward achieving improved plastic waste recycling. Lagos East District households, in low economic stratum are less likely to treat separated plastic waste properly than those of Lagos West District, in high economic stratum. In some cases where plastic waste separation is claimed to be practiced, the waste carting trucks or compactors have only one bucket to carry all waste types. Dedicated recyclable waste trucks are needed in area that practice waste separation to avoid the wasting of efforts on the part of the households.

Most reasons given by households for not separating plastic waste at household level was that households have only one waste receptacle. The need for adequate waste containerisation cannot be over – emphasized as it is one of the initial good steps toward sustainable solid waste manage process. The willingness to participate in plastic waste separation at the Government’s directive showed that low educated households, in low nature of dwelling unit, in Lagos Central District are less likely to be willing to participate in plastic waste separation in compliance with the Government’s directive than those high educated, in high nature of dwelling unit, in Lagos East District. The practiced of ‘one size fits it all’ will need to be discontinued as different ideas and perception exist for different people and dwelling area among other variables. In a near similar vein, the household with the low nature of dwelling unit are less likely to accept the placement of ban on single – use plastics than those in high dwelling unit, which could be indicating the possibility of resistance to such policy and hence, must be put into consideration.

Recommendation for Application

To really understand reasons for the recommendations drawn, it will be necessary to paint a general picture of the current waste management practice in Lagos, Nigeria. The study identified that, linear metabolism of resources and the extant solid waste management practice in Lagos state is mainly focused on collection and disposal of the collected waste at the

dumpsites without any further treatment afterwards (cf. Sesan, 2018). Inferably, health and sanitation reasons are the major focus, while economic and environmental aspects remain abysmal. The solid waste management plan of 2003 has been the framework that the processes of solid waste management is based on in Lagos (MOE & WR File). The present desire is to shift from linear metabolism of plastic to circular metabolism of plastic materials (cf. LAWMA, 2022) as agreed by majority of the interviewees. The interviewees were of the opinion that, there is a need for the formulation of evidence – based working policy that will improve the environmental performance of the state and her sustainability rating from the global eyes (cf. Liyala, 2023). It is a known fact that so many things have changed since 2003; such as the population surge, the uncontrolled urbanization, industrial and economic development, standard of living and the nature of household's waste (cf. Kasim et al., 2021; Koko et al., 2021), waste management types and the global environmental acceptability of applied methods for managing waste.

The evidence – based plastic circularity – minded policy according to the study findings should be formulated with the involvement of identified major stakeholders, allowing stakeholders to deliberate on the matters at hand as it may concern them directly or indirectly and the possible responsibilities of everyone in the management line of the production, use, and management of arising plastic waste. One of the study's findings showed that plastic waste mismanagement in the state is as a result of human negligence, especially the householders who are the major generators of plastic waste (cf. Ajoku & Okoro, 2020) and the first handlers of the generated municipal solid waste. Some interviewees were of the opinion that, the sustainable management of waste should start with the major generators and the first handlers of the household municipal solid waste. Hence, there is need for the involvement of the households in any intervention plan towards sustainable solid waste management plan in the State. It was mentioned that non – inclusion of the households or the inadequate consultation

with the major stakeholders in the policy and planning stages of waste management plans in the study area is seen as a slap on the stakeholders who in the end are expected to participate at the implementation stages. It is also a known fact that the refusal of households to give their waste to the government – approved waste collectors will crumble the programme. In such situations, government will usually use enforcement activities to bring about compliance. The enforcement on its part cannot reach the entire Lagos even with time. It is therefore necessary that the authorities should shift from command – and – control to participatory governance on solid waste matters.

Efforts must be put in place for the promotion of community – based sustainable waste management system/strategy (cf. Rigasa et al., 2016). A strategy that should ensure and encourage the effective practice of the prevention of solid waste generation, its reduction, re – use, recycling, composting, and the proper disposal of any unavoidable waste generated in the end as corroborated by Ugwu et al., 2020. As one of the principal officers from MOE & WR stated, ‘there is need to catch them young’ – purporting that the younger ones needed to be taught about the care for the environment at their early ages of education. At present, sustainable environmental education is missing in our primary school curriculum. It is therefore advocated that for the promotion of environmental awareness, environmental education should be included in the primary and secondary school curricula as well as promoting the same in the public and private sector to ginger the creation of environmental awareness among the populace.

For a successful implementation of the advocated circular economy of plastic production, use, and the management of arising plastic waste, it is essential that the majority of the households participate in the sorting of waste at source or at the household level as the study revealed. This should be accompanied with a proper storage of waste at the household level as well as other premises where waste of different types are generated. However, it should

be recalled that, one of the findings of the study showed that compliance with the LAWMA's – recommended waste receptacles has remained a problem in Lagos.

The separated wastes in their categories needed to be carted away by approved agents, at the right time with the right equipment. The local itinerant waste collection system must be up – to – date, strengthened and the system should leave no room for waste leakages as is usually observed when PSPs failed to pick the waste as at when due for one reason or the other (Figure 5.6), or when the receptacles are filled – up before the supposed times of collection.

Figure 5.6

Overfilled Household's Waste Receptacles resulting in Littering



Note. Overfilled Waste Receptacles and Littering at a Residential Block of Flats Resulting from Failure of the Itinerant Waste Collector to cart Waste as at when due (Self – taken).

The study findings showed that the recycling of plastic waste materials is adjudged as one of the most creative and innovative approaches for the management of plastic waste as advocated in the circular economy concept of plastic products (cf. Abramenko et al., 2021; Olowosile et al., 2020; Oyake – Ombis et al., 20215). It was emphasized in the FGDs that, when plastic waste recycling is well implemented, the three pillars on which sustainable development concept hangs on will be achieved as it will not only lead to reduction in plastic

pollution, but will lead to wealth creation and social equity (cf. Mwanza et al., 2018; NJWW, 2015). It is worth advising that prior to investing in the business of plastic waste recycling, it is very necessary that comprehensive researches are carried out to determine all possible factors that may influence the business in one way or the other. The error of the past on plastic waste management intervention in the State should be avoided. Therefore, information concerning the quantity of plastic materials that may be likely available for the recycling processes has to be indexed, it is important to determine the best possible technology that will suit the Lagos context, based on the available fund or the possibilities of finding fund. More so, what will be the prospect of the recycled plastic products must be determined and made publicly available to would – be investors as government alone cannot handle all generated plastic waste. The study findings showed in the survey strand that the majority of the respondents agree that there are inherent economic values in plastic waste. The economic value of plastic waste should be tapped into, the incentivizing principles should be considered for implementation in an effort to effectively manage plastic waste in Lagos as have been practiced in countries making progress in the management of plastic waste (cf. Browning et al., 2021).

Some Lagos State Government officials (LAWMA and MOE&WR) and some scholarly papers mentioned that some Nigerians have designed plastic recycling machines that were fabricated from locally sourced materials. The machines were said to have been commended for their high recycling/crushing rate with the efficiency of between 82.2% to 97% according to Kehinde et al., 2020. Sequel to this finding, it is recommended that such innovators should be partnered with in line with the principle of local content encouragement to fabricate more of the machines to be used for plastic waste recycling in order to boost plastic material recycling rates in the state.

The survey reveals that 50% of the respondents use bin or waste basket for storing waste, while 37.5% uses waste bags as receptacles for waste, another 1% use cartons. The

remaining percentage do not have in – house waste storage receptacles. It is very necessary that effort should be made to increase the percentage of households that use the appropriate and recommended waste receptacles. Discussions with some residents have shown that the price of the bin as it is being sold by LAWMA through the ‘Adopt – A – Bin’ programme is considered costly at Thirty – nine Thousand Naira per bin. Each household is expected to have two, blue – coloured receptacles for recyclable waste, while the green – coloured bin is for food waste. It is worthy to mention that the majority of such complaints of the cost of the bins is from the Low – Income areas, as such, it suggested that the authorities should consider the possibilities of subsidizing the purchase of the bins for the less financially endowed residents. Similar subsidy can be considered in terms of waste service charges in the State.

The study showed that there is poor and unsustainable plastic waste management practice in Lagos (cf. Olowosile et al., 2020) and the environmental perception of respondents from Low – Income, Medium – Income, and High – Income areas differ in that aspect. The High – Income area respondents showed more positive perceptions towards the need to manage the environment more sustainably than those of the Medium – Income, and those of the Medium – Income being higher than those of the Low – Income areas. In the light of the foregoing, environmental advocacy should be concentrated more on the Low – Income areas than the High – Income areas.

The High – Income residents, especially the organized estates showed more willingness to participate in environmental matters, and most of them use the State Government’s – recommended 240 litres waste bin with lids and practice curbside waste carting. Similar estate where they practice waste sorting should be identified across the state, and be given high priority in the collection of their waste while the recyclables are collected separately to avoid the comingling of already separated wastes as it is being practiced in some quarters. It is very

necessary that the off – takers of the collected recyclables use recyclable materials in a more environmentally – friendly manner.

The basic descriptive nature of plastic waste mismanagement in Lagos metropolis showed features of environmental problems that are classed as wicked environmental problem with socio – technical entanglement of the society to unsustainable practice of plastic waste management as concluded by the majority in KII sessions (cf. Duckett, et al., 2016; Remington, 2013; Balint et al., 2011). Such dynamic environmental and wicked problems can be attended to through the application of the principles of Transition Management Theory (TMT). TMT advocates that the managers of the transition should identify innovative activities from the society, either individual or group/community for which to steer in the sustainable direction. Plastic waste recovery and recycling has been identified as one of the innovative approaches that is going on at the background or niche level (cf. Olowosile et al., 2020) that could be tapped into. It is hence recommended that the command – and – control approach applied in the management of plastic waste so far in Lagos should be replaced with more economic and market driven approaches that will include incentivizing and partnering with the communities.

Local Non – Governmental Organizations (NGOs) should be co – opted to help create environmental awareness among the citizens in order to convince them on the need to practice community sustainable solid waste management. The populace should be educated and informed of the possibilities of making extra fund through household waste separation and the sale of recyclables.

Since the study findings showed Extended Producers Responsibility (EPR) is lacking in the State, it is necessary to institute and implement the plastic EPR scheme that will ensure that the producers of specific products remain responsible for the anticipated end – of – life consequences of their products, reduce pollution and heighten resource efficiency as suggested by the interviewees (cf. WWF, 2019; GIZ, 2018). This, should include the plastic Deposit

Refund Scheme (DRS) that will enhance plastic waste returns as practiced elsewhere (cf. Gillet, & Disselkoe, 2021; European Union, 2021), increasing reuse and strengthening the recycling system of the State. For EPR to be successfully implemented in Lagos, it is very important that the quantities of products that the producers put into the markets are known. Since it is understood that there is value inherent in plastic waste, the advantages of this economic value should be utilized to develop context suited waste – to – wealth programme, as well as waste – to – energy programme.

It is recommended further that plastic waste should be considered to be used for the manufacturing of construction materials either for road, housing, floaters, among others as suggested by some respondents. Huang et al. (2022) asserted that the conversion of plastic waste to materials such as tar for the construction of roads or for the purpose of mixing with other materials for the production of concrete for house construction have been considered as one of the efficacious approaches for the management of plastic waste. Some of its advantages included the ability for it to be adopted and adapted to suit local contexts, contribution to the reduction in greenhouse gas emission, the produced materials from plastic waste such as building blocks, pavers, among others are very durable and as such, the sustainability of roads or constructed houses are higher (cf. Daftardar et al., 2017).

Plastic packaging material waste is a major fraction of plastic waste found in municipal solid waste in Lagos and they are one of the prominently seen plastics in public places as litters. The nuisances associated with the mismanagement of these single – use plastic have led to plans by the Federal Republic of Nigeria and Lagos State to outrightly place a ban on its use, like it has been done in some places. However, it is worthy of mentioning that about 46.3% of the respondents claimed they cannot do without the use of single – use plastics. It is recommended that the planned outright ban of single – use plastics in Lagos should be reconsidered while the ban in a phased manner should be considered as implemented in India

(Kirubadevi & Pavithra, 2020). However, whether outright ban or phased – banned, it is very necessary that the alternative materials to the plastic materials should first be made available to the public at a cost equivalent or less to the conventional plastic's cost.

Kirubadevi & Pavithra (2020) asserted that biodegradable plastic materials made from renewable resources or mixtures of synthetic resources have been developed and are being embraced as alternative to plastic or single – use plastic materials. These biodegradable plastics are claimed to exhibit near similar characteristics and functionalities with the conventional petrochemical – based/non – biodegradable plastics. The renewable raw materials used for the production of biodegradable plastics include plant or animal materials as against the use of non – renewable resources of petrochemical substances. After the end of service life of the biodegradable plastics, the waste can be domestically or industrially composted, and by so doing, the amount of waste reaching the dumpsite is reduced. Examples of natural raw materials for the production of biodegradable plastics include, bagasse from sugar cane, maize, banana plant, seaweeds, rubber plant, milk, animal and plant oils, among others. In some cases, biodegradable plastics are formulated with the combination of bio – based and petrochemical – based raw materials in various percentages to reduce cost (Kirubadevi & Pavithra, 2020). Variants of biodegradable materials that could be used as alternative are cloth made from organic cotton, hemp, wool; wood to replace items such as cutting boards; bamboo for basket making, drinking straw, furnishing materials; pottery and ceramics; cardboards; paper; among others (Kirubadevi & Pavithra, 2020; Shields, 2019).

Despite the fact that the above – mentioned materials are biodegradable, their degradability rate differs and when such materials are allowed to litter the environment, they will end up constituting environmental nuisance. It is therefore pertinent that an effective system of waste collection is put in place, ensuring that the majority of the residents or

households practice waste separation at source, while industrial and domestic composting are encouraged as much as possible.

Recommendations for future research

The study was carried – out using the mixed methods research approach and the research design was mixed explanatory sequential design that entailed the use of qualitative research to facilitate the results of the initial quantitative findings. The first strand of data collection was carried out by conducting a cross – sectional survey using well – structured questionnaires to capture the opinions, beliefs, perceptions, attitudes, among others toward sustainable waste management of the study population that were stratified into Low – Income, Medium – Income, and High – Income areas. The sampling technique for this phase of the study was convenience sampling, also known as non – random sampling or a non – probability sampling technique. One major limitation of this sampling technique is that the findings from such study cannot be used for generalization to the general populace as the findings are usually limited to the subgroups. Sequel to the foregoing, the identified trends of opinions, perceptions, attitudes, beliefs among others of the subgroup should be further studied using random/probability sampling techniques to retrieve a more generalizable information for the observed trends. This is necessary, since the anticipated policy will have to cover the entire Lagos State.

One of the findings revealed that the respondents from High – Income areas showed highest concern for their environment than those of the Medium – Income area and those of Medium –Income being more than those of the Low – Income areas. Some of the residential estates were observed to be practicing waste separation at the household and estate level. The study should be carried out to identify all the estates that are already practicing this sustainable – minded solid waste management practice to serve as baseline information before the implementation of any further intervention programme.

The Lagos State Government is planning to put a ban on single – use plastics in Lagos metropolis and the enquiry into the possibilities of the respondents being able to do without plastic use showed that 40.7% of the respondents claimed they cannot do without plastic use. On the planned ban of single – use plastic, 25.8% of the respondents claimed they were not willing to comply to such a ban or directive, while 13.1% were indifferent. It was recommended that the planned outright ban should be reconsidered for a ban in a phased – manner. It is worthy to mention that one of the initial steps necessary to be taken before placing a ban on single – use plastic will be to first identify the plastic products that needed to be banned. To squarely do the immediate past, study will be needed that will take an inventory of all the types of plastic products that entered the state markets and the quantities, their chemical compositions, recyclability, reusability, among others. Information from such studies should be used to define the plastic products that needed to be banned and at what time that should be done.

It is recommended that alternative products (Environmentally Degradable Plastics – EDP) to these existing petrochemical plastics that currently constitute untold nuisances in Lagos should be used to replace the plastics. However, the level of availability of these alternative products were not investigated. Hence, further study is needed for the determination of existence of the alternative materials to replace petrochemical – based plastics, to determine the accessibility of such materials, while ensuring that there is an equilibrium between the costs and benefits (cf. Phillips et al., 2020).

Part of the proposed study should investigate the viability of the alternative to petrochemical – based plastic products in Lagos, investigate the likely advantages and disadvantages, determine the availability of the renewable raw materials for the production of the bio – based plastics that could ensure that such transition is sustainable and successful. On a larger side, the life cycle of some of the selected alternative products should be looked into

in considering the possible environmental impacts. Some other related questions could also be investigated in addition to the ones enumerated above.

One of the economic instruments that some other nations or cities have applied to curtail the leakage of plastic packages that is recommended for adoption and adaptation to suit the Lagos context is the institution of the plastic Deposit Refund Scheme (DRS). The possibilities of the instrument to contribute immensely to the abatement of the environmental nuisances was discussed in Chapter Four (4), though the different types of DRS as established and ran by different countries were not detailed. To be able to determine the specific DRS that will suit the Lagos context, it is necessary to carry out further research to determine the existing types from which the best that can be used for the Lagos context can be identified. Information that could help in the adaptation of the adopted DRS should be gathered to ease its establishment. More so, most of DRSs mentioned by different authors were centred on plastic bottles. However, plastic bags and packaging materials also constitute part of the plastic waste mismanagement problems. It is therefore necessary that further studies are carried out to decipher that which could work best for the plastic bags and other packaging materials. Unfortunately, report(s) on where and how such DRS for plastic bags is hard to come by for easier transfer of ideas. A pilot scheme in this regard could be instituted in small scale as a way of research in order to determine how suitable it could be for the purpose of scaling – up. Along the same line of actions, the possible implementation and modalities should be investigated.

It was claimed that some Nigerians have used locally sourced materials to fabricate plastic waste recycling machines that were acclaimed to have high efficiencies. In this regard, further research is needed to further confirm and identify the ones that can be best applied to the types of plastic wastes that are peculiar to Lagos. The study can look into the identification of such machines and how they can be used to process contaminated plastic waste, since the majority of the waste types are comingled in Lagos. In the same line, the study could determine

the viability or marketability of the products created from plastic for ease of adsorption into the Nigerian markets.

The extant solid waste management problem in Lagos showed some characteristics that when critically examined, one could infer that it belonged to environmental problems that are classified as wicked environmental problems that the pathways to solving them are not straight. This study used the concept of circular economy and Transition Management theory as a lens, a further study along this sustainable plastic waste management can be carried out using Strategic Niche Management (SNM) theory in identifying all radical innovations arising from extant socio –technical value chain of plastic waste management in Lagos. The Strategic Niche Management as a way to complement could be combined with the Stakeholder Theory (ST) to extensively determine all necessary stakeholders and decipher how best their corporations could help to steer the identified radical innovations towards the transitioning to sustainable plastic waste management.

One of the identified radical innovations is the plastic waste recycling. It was found out that the major reasons for the informal sector participation in the plastic recycling process was for economic reasons. Sustainable solid waste management as advocated by the concept of sustainable development is based on the three pillars of economic development, social development, and environmental protection aspects (Filho et al., 2020). Further study is needed for the identification of the fundamental drivers that could influence or are influencing plastic recycling towards the transitioning to sustainable management of plastic products' post – consumer stages. Such study could apply the Life Cycle Assessment to appraise economic, environmental, and social implications of the plastic waste recycling chains. The study may decide to identify the phases that have the most adverse impact in order to reduce the negative impact of the recycling processes (cf. Mwanza et al., 2018). In the same line, the further study could be centred on enumerating all recycling outfits in Lagos, assessing their economic and

environmental impacts to compare the levels of the impacts of the technologies applied. The challenges and the possible opportunities inherent in the recycling outfits needs to be identified to help would – be or prospective investors in deciding to venture into the business.

The drivers that are likely to heighten or enhance the transitioning to the sought transition to sustainable plastic waste management by improving the recycling system should be identified to encourage and ensure their continuity while room for improvement is created. This becomes necessary to checkmate the use of technologies in recycling that are not environmentally – friendly. For instance, there was a time when it was rampant to see scavengers burning tyres at the dumpsites just to recover iron wires. In such situations, the negative impact of the technology applied may have more negative impact on the environment (Filho, 2020) than the value of the retrieved iron. In essence, the technologies applied for the recycling of some prominent plastic products or plastic types should be assessed to determine their ecological impact by calculating their carbon footprints. The study may decide to focus on the plastic recycling that generate plastic pellets from plastic waste, either comingled or single type of plastic.

The Circular Economy concept does not only look at the post – consumption life of products but it considers the entire life cycle of the product (Filho, 2020), i.e., from cradle – to – grave. Hence, Circular Economy – thinking production will put into consideration the sustainable production of products that will enhance their recyclability by removing materials that might hamper their recyclability. Further research should be carried out to determine the composition of the major plastic products produced in the nation and their level of recyclability. The factors that are influencing the recycling rate of plastic in Lagos should be identified in the further study, so as to know other possible promotion factors that will enhance recycling in the State. Such study could be carried out at the industrial level or at the household level, for the

households to determine the basic elements that shapes the behaviours of the householders towards plastic waste recycling in an attempt to closing the plastic product loop.

Part of the study findings showed that one of the contributory factors to the existing plastic waste mismanagement in the study area is the lack of sustainable plastic waste management policies and standard regulations on sustainable plastic production, use, and the management of the post –consumer stage. Several policy instruments were discussed as having been deployed to manage the plastic waste problems (Pandey & Manuja, 2020); however, it is necessary that further studies should be carried to critically evaluate some of these policies using some basic criteria. Some of the identified policy instruments suggested for possible adoption and adaptation to suit the Lagos context are, economic instrument (levy and deposit refund scheme), regulatory instrument (weight standard/thickness, additive control, outright ban), and informative instrument (environmental education from primary school level, awareness creation). The study could evaluate the above – mentioned instruments using the basic criteria such as, their effectiveness in environmental protection, cost – effectiveness through cost – benefit analysis, political acceptability, and enforceability.

Like in most other developing countries, the informal sector and small – scale or small medium enterprises are the ones majorly participating in the plastic waste recovery and the recycling business for economic reasons. In Lagos State, the material recovery activities of the scavengers are considered illegal, yet their contributions toward the reduction of the amount of plastic waste buried at the dumpsite are enormous. It is suggested that there is need to integrate these scavengers into the mainstream of solid waste management system in the state. In this regard, further study is suggested to take the inventory of the scavengers in Lagos State, determine the type and amounts of recyclables they collect, determine the off takers of the recovered plastic waste and what the off takers do with the plastics. This investigation could give further direction in the mapping out of the flow of recovered plastic waste distribution in

the state (cf. Hidayat et al., 2019). A follow up on the identified recovered plastic waste off takers on what they do with the recovered plastic waste as well as the processes involved will help to determine the extant processes of plastic waste recycling and reuse in the state of Lagos.

The recommendation to integrate the most relevant informal sector players into the mainstream of the solid waste management in Lagos State will necessitate the critical identification of all existing and relevant stakeholders to determine their positions, relevancies, responsibilities/roles, power, among others. The study could apply the Stakeholder Theory in the process of the stakeholder analysis to enable the creation of a comprehensive transition learning arena (platform) as advocated by the Transition Management Theory protagonists (Rotmans & Loorbach, 2009; Kemp et al., 2007).

Conclusions

The municipal solid waste management system leaves room for the leakages of waste along the management value chain in Lagos State. The most prominent fraction of the municipal solid waste that its leakage has constituted the most obvious physical nuisances is the plastic waste. Several efforts have been made by different State Administrations to curtail these plastic waste leakages and their subsequent environmental, social and economic adverse effects; however, the effects of the interventions have remained very abysmal. Apart from the government factors, the application of inappropriate technologies to manage plastic waste, its generation, leakages, and mismanagement is also as a result of social factors, like the citizens/populace's behaviours/attitudes. The main purpose of the present study was to investigate the role that the Lagos Metropolis residents as householders at their households' levels played in the current mismanagement of municipal plastic waste, that the arising problems are bedevilling the State. Furthermore, to also look at the roles they (households) could play to accelerate the transitioning to sustainable municipal plastic waste management

in the megacity of Lagos, using the Circular Economy concept (CE) and Transition Management Theory as guiding frameworks.

The study adopted mixed methods research approach as it had to gather the opinions, beliefs, attitudes, culture, positions, practices, among others of the respondents from stratified study populations of Low – Income, Medium – Income, High – Income areas with respect to sustainable solid waste management through a survey snapshot using structured questionnaire. The study also conducted face – to – face individual interviews and Focus Group Discussions (FDGs) to gather information on human life experience and knowledge. Mixed explanatory sequential research design which entailed the use of qualitative research to facilitate results of the initial quantitative findings was applied. Through the use of the research design, data gathering and analysis were triangulated to get a thorough view of the subject being examined.

Lagos Waste Management Authority (LAWMA) is the agency of Lagos State that is solely responsible for the management of municipal solid waste in Lagos, while the supervisory Ministry- Lagos State Ministry of the Environment and Water Resources develops the supporting policies in conjunction with other relevant government Ministries, Departments, and Agencies (MDAs). The study findings showed that the policy formulation group do not usually engage other major non – governmental stakeholders in the value chain of plastic production, use, generation of waste and the sustainable management of the product's end – of – life. The exclusion of these relevant stakeholders in policy formulation stage, especially the households, who are the highest generators of municipal plastic waste and the first handlers of household generated plastic waste is claimed to be a major contributory factor to the failure of most intervention programmes. This act of exclusion of relevant stakeholders is contrary to the tenets of the Circular Economy concept that advocates for the cooperation of all major and relevant stakeholders in the value chain of solid waste management. The Transition

Management Theory also advocates that before the forming of the transition arena, major stakeholders should be adequately engaged.

Since the households were not involved in the waste management policy making in the study area, one will not be far from being right if one states that the role ‘imposed’ on the household in this dispensation of municipal solid waste management is for the households to properly store the household generated waste temporarily within the dwelling units until it is due for collection by the assigned Private Sector Participator (PSP) in waste collection, transportation and disposal (Ibrahim, 2023). It is mandatory for householders to patronize the PSPs for the collection of their waste and to pay for waste service charges when bills are distributed. The unwillingness to pay for waste services in some quarters, especially in Low – Income areas have led to the refusal of some households to handover their waste to the assigned PSP. Since the household kitchen waste cannot be kept in the dwelling unit for too long, the households will find ways to illegally (since other available means are considered illegal by the existing environmental laws) dispose their waste. Such illegal means can be through the patronage of cart – pushers, dumping of the waste on open spaces, road median, bushes, drainage channels, bodies of water, burning of waste, among others. This habit, has been one of the channels of plastic waste leakages in the State, thereby contributing to the hampering of the transition to sustainable plastic waste management in the State. However, it is worthy to mention that one of the contributory factors to the existing solid waste management in the State is the lack of sustainable solid waste management policy as well as the political will to properly enforce the existing environmental management laws in the State.

The importance of each household using appropriate waste receptacles was reiterated in the study and LAWMA’s adopt – a – bin initiative of 2021 which specifies that each household must have a standard waste receptacle of 240 Litres as a minimum capacity with a lid or they risk being prosecuted. However, the result of the study showed that households use

different types of waste receptacles, such as cartons, plastic baskets, plastic bags, plastic gallons (that the top is slit – opened), used drums, standard waste receptacles, among others. Meanwhile, some households had no specific waste receptacles. The arrangement for the pick – up of waste for residential premises usually is once in a week. Where households used waste receptacle that are inadequate to contain the generated waste, the tendency is to dump the waste on the ground or take it elsewhere which is mostly illegal and it becomes an avenue for waste leakages.

There is a seemingly general concession by the majority of the respondents, both from the quantitative and qualitative strands of data collection, acknowledging the observation of plastic waste littering in the State and that there is need for action(s) to be taken to curtail the upward trend. That several administrations of Lagos State have made efforts to curb the plastic problems is an affirmation that even in the regulator's quarters, the problems of plastic waste needed solutions. Literature review showed that there is no single straight solution to the existing plastic waste problems which is also linked to socio – cultural factors. The plastic waste problem is complex as it cuts through many facets of life, efforts to solve the problem in one aspect of life, gives a feedback effect in another aspect, and its solution will require socio – cultural changes and a societal re – orientations. These characteristics of the plastic waste management problems bear close resemblances with socio – environmental problems classified as wicked environmental problems. Such problems are as a result of socio – cultural activities of the society, the problems are acknowledged and there is usual acceptance that urgency is needed to curb the trending nuisance; yet, the society is observed to have continued in the unsustainable practices. Such societies, like the Lagos situation are said to be locked – in to an unsustainable socio – technical practice of solid waste management. This kind of unsustainable practice and the entanglement of the society could be resolved by the calculated

implementation of the principles of Transition Management Theory that works in line with observed sustainable innovations at the micro – level (niches, individual) within the society.

One of such observed sustainability innovations identified in Lagos society as it concerned the study at hand is the plastic waste recycling which is currently being carried – out by the informal sector (individual, group, niche levels) along the value chain of solid waste management and the very few small and medium enterprises along the plastic production sector. The study showed that the major driver that is propelling the extant recycling activities is financial reasons, though it is labelled as sustainability innovations as it contributes to the reduction of the amount of plastic waste buried in the natural environment and subsequent would – have – been pollutions. However, the Sustainable Development concept from which sustainable municipal solid waste management ideas are derived is based on three major pillars of social development, economic development, and environmental protection. It is therefore necessary that the existing recycling practice in Lagos is steered to sustainable state. While the Transition Management Theory's tenets are used to guide the transitioning processes, the Circular Economy thinking of plastic production, consumption, and management of the generated waste could be applied to close the loop of plastic metabolism to ensure the shift from the current Linear Economy of plastic to its Circular Economy.

To really shift to the Circular Economy of plastic in Lagos, certain practices along the current solid waste management practices have to be changed based on the findings from the study that were noticed to be contrarily to sustainable development tenets. For instance, around 64% of the survey respondents claimed that they comingle their generated plastic waste with other waste types, 13% separate the plastics that they will re – use personally, 10% of them throw away their generated plastic as they see fit, while 9% separate plastic waste for recycling purposes as they deliver the plastics to recyclers. Based on the existing plastic waste recycling technologies prevalent in the Nigerian industrial sector, to achieve the best of recycling, it is

necessary that plastic waste sorting at source is practiced by the majority of the Lagos households. The respondents from plastic recycling companies claimed that on the average, over 95% of the plastic waste they receive as used raw material for recycling are recovered from comingled waste stuff as shown by the physically observable stains or dirt. It is inferable from the information that the practice of waste separation at source is still at its very minimal level in the State.

Though the majority of the plastic waste used in Lagos by recycling industries are scavenged from the dumpsites across the State, yet the process of recovery of these recyclables are considered as illegal by the State. Instead of the government dissipating energy to enforce the no waste scavenging directives at the State's dumpsites, the activities of the scavengers should be coordinated by the authorities, identify and register them, put the scavengers under the leadership of recognized executives in order to integrate them into the mainstream of solid waste management in the State. In the process, data on the quantities of recovered recyclables from the dumpsite could be identified; through this, the identity of the middlemen and the off – takers of the eventual recycling companies using these materials will be known. Hence, the paucity of data on recovered plastic waste flow could be drawn for better intervention planning.

Several reasons were given by the respondents why they do not practice plastic waste separation at household level, and these included, that the households have only one waste receptacle where all waste types are deposited (42.4%); next to the group are those (25.7%) who claimed that plastic waste separation was not practiced because they are not aware of any law that mandates the household to separate plastic waste from other waste; others, circa 22.3% stated that there was no visible reason for them to participate in such waste separation; while about 4.2% of the respondents claimed that they do not know where the separated plastic waste could be sold; another reason was that waste separation is an additional cost (2.8%); and the remaining 2.1% claimed that the separation of waste is a difficult task. These given reasons

among others could be an indication that the households are not well – informed on the matter, which also could inform the lack of tangible progress in the result of efforts made to enhance the plastic waste recycling rate in the Lagos Metropolis.

Similar inference can be drawn from the enquiries into the use of the PAKAM App to aid the participation of the residents in Lagos Metropolis in the Plastic Recycling Initiative of LAWMA that was adopted in mid – 2021 which showed that only about 24% of the respondents have heard about the App. However, out of the percentage of the respondents that have heard about the PAKAM plastic recycling App, only about 8% of them do use the App for the purpose that it was adopted to achieve. This could possibly indicate that the interventions carried out by LAWMA to enhance plastic waste recycling in the State have not yielded tangible positive results. It is surmisable that the recycling innovation in Lagos still remain with the informal sector with the driver being financial reasons and as such, the much – needed transition is still at the developmental stage. At this stage it is conclusive to state that the current process is not sustainable as the motive or driver does not include the protection of the environment and the enabling of social equity, but remains basically for personal financial aggrandizement.

Also necessary is the proper containerization of household waste using the State's recommended 240 Litres of plastic waste receptacle with a lid or a waste receptacle that can contain a week – long household generated waste with extra room for more, in case there is delay in coming to pick the waste on appointed days as have been observed. The compliance to the LAWMA's adopt – a – bin initiative/directive of February, 2022 is very low and the planned prosecution of non – compliant households that was formally put on hold because of the presidential and gubernatorial elections of 2023 has been re – ignited (see Section 4.4.5; Figure 4.49 & 4.50). The 'hold' here was not because the authorities realized that the command – and – control approach to achieve the desired goals were misplaced, rather, for the fear that the ruling political party might lose the support of some of the Lagos residents in the elections

as a result of the proposed enforcements. One may ask; had the authority concerned implemented the programme after massive stakeholders' agreement, would there have been any need for putting a hold to the planned prosecutions on defaulters? It is therefore necessary that the households or the Lagos populace are carried along from the planning stages, through implementation, to review and assessment stages for all programmes that will involve the resident's participation at the implementation stages. Their involvement from the planning stages will give them the sense of belonging and could ginger them to take the interventions as their own, especially at the household and community levels.

Lagos metropolis is not alone in the issue of plastic waste management problems. Other nations and cities that have similar plastic waste management challenges have adopted different measures in order to curb the nuisances. Some of the policy instruments that are worth adopting and adapting to suit the Lagos context that are more diplomatic than the usual command – and – control included the following, economic instrument, regulatory instrument, and informative instrument. Suggested for adoption among the variants of these policy instruments are, the institution/establishment of plastic Deposit Refund Scheme (DRS) and levying according to the economic policy instrument; development and implementation of plastic production standard with respect to weight standard/thickness, additive/content control, ban in phases as in regulatory instruments; while the informative instrument will look at the creation of awareness through massive campaign and the insertion of environmental education in the primary school's curriculum. When these instruments are successfully implemented to manage the plastic waste to achieve the shift from the extant Linear Economy to the much – desired Circular Economy of plastic production, consumption and the sustainable management of the end – of – life of all plastic products, it will also see the State Administration shifting from government to governance.

The non – biodegradability features of petrochemical – based plastic wastes are one of the major reasons why its nuisances/littering is seen to persist for so long, even to the ordinary human eyes. In an effort to avoid this, some nations have advocated and are practicing the use of alternative materials to petrochemical – based plastics, such alternative products have near similar features of plastic apart from the fact that they are biodegradable and are produced from renewable raw materials of plant and animal origin. However, it is worthy to mention, based on observations/experience that even if success is achieved in shifting to alternative bioplastic use, without the change of attitude towards plastic waste disposal, the plastic waste littering will continue as several weeks are needed for the biodegradation of the bioplastics.

On a more general side, the plastic wastes have been used in some countries for the generation of electricity in waste – to – energy projects. This will help to reduce the number of plastics buried in the natural environment and as well as generate electricity that its generation and supplies are in a deficit state in Nigeria. Worthy of emulation also, is the use of products made from plastic waste in the building industry to construct houses in mixture with other building components at different amounts to make pavements and building blocks. In a similar vein, the idea of using the same product in the construction of roads should also be considered for adoption and adaptation for the Lagos situation.

The quantitative strand of the study involved the use of a cross – sectional survey with a structured questionnaire to scoop information from a stratified study population based on socio – economic status of dwelling areas. The participants were recruited using a convenience sampling method to determine the, willingness to pay and participate in sanitation programmes, opinions, culture, attitudes, among others of the study population to see how it may align with previous studies findings from probability surveys used as reference samples (Chen, 2020). The willingness to pay for a matter that could improve community sanitation is highest in the High – Income areas; the High – Income areas are more educationally endowed and have more

environmental consciousness. Among other factors, high socio – economic status, education, housing area of households have positive influences on the willingness to pay for improved sanitation services in Lagos. The High – Income areas could be considered for use in the trials or pilot schemes for more sustainable environmental management programmes that may have some financial implications on the residents, while the possibilities of subsidy for the Low – Income areas in a similar vein could be considered. However, it is worthy of mentioning that one major limitation of the convenience sampling technique is that the findings cannot be used in generalization but it can for sure be used for the subgroup of study. This mentioned limitation is partly accounted for by the use of results from studies that used the probability sampling in Nigerian cities as auxiliary information (Chen, 2020).

However, the solid waste management associations in the study area showed some specificities of the subgroups: -

That the low educated households, in Lagos Central District, in low socio – economic stratum were less likely to generate household waste than those high educated households, in Lagos West District and at a higher socio – economic stratum. On the other hand, there is a significant positive correlation ($N=217$) between household solid generation and the nature of dwelling ($\tau = 0.030, p < 0.05$).

The older age groups householders, in low nature of dwelling, in Lagos East District and low economic stratum are less likely to store household waste temporarily than the younger age groups, in high income dwelling units, in Lagos West and Central Districts, in high economic stratum.

Households in the Lagos Central District, in low economic stratum are less likely to generate plastic as part of household's solid waste than those of Lagos East and West Districts in the high economic stratum.

The older age groups in low economic stratum are less likely to come and dispose plastic waste than those of the younger age groups in high economic stratum.

Households from Lagos West and Central District, in lowly economic stratum are less likely to ever have seen plastic material than those of Lagos East District, in the highly economic stratum.

Low educated head of households, from Lagos Central District in low economic stratum are less likely to have ever used plastic material than the highly educated other members of household, from Lagos East and West District in the highly economic stratum.

Households in Lagos West District, in a middle – economic stratum are less likely to frequently use plastic than those of Lagos East and Central Districts in the other socio – economic strata.

The older age groups, of Lagos West District, in low economic stratum are less likely to frequently purchase plastic material than those younger groups from Lagos East and Central Districts, in high economic stratum.

The low educated respondents were less likely to notice plastic waste littering than the high educated ones. There is a significant positive correlation between ($N=218$) notice of plastic littering and household position ($k = 0.036, p < 0.05$).

The low educated households, heads of household, in low economic stratum are less likely to have noticed plastic waste littering at market/plazas than those high educated, other members of the household in high economic stratum.

The low educated households, in Lagos Central District, in a middle – income stratum are less likely to agree that littering is not good than those highly educated, in Lagos East District in the high economic stratum. Meanwhile, there is a significant positive correlation ($N=218$) between condemnation of the plastic waste littering and increasing nature of dwelling unit ($\tau = 0.032, p < 0.05$).

Hence, the lowly educated, other members of the households in low housing unit are less likely not to acknowledge that there are issues associated with plastic waste mismanagement than those of the highly educated, heads of households of high dwelling units.

The low educated households, in Lagos Central District, in high economic stratum are less likely to identify issues associated with plastic waste mismanagement than those high educated, in Lagos East and West District, in low economic stratum.

The low educated households, in Lagos Central Districts, in low economic stratum are less likely to acknowledge plastic waste non – degradability than those high educated households, in Lagos East District, in high economic stratum.

The low educated households, in Lagos Central District are less likely to better manage plastic waste than those of the high educated households, in Lagos East District.

Low educated households, in Lagos Central District are less likely to acknowledge that plastic waste has economic value than those high educated households in Lagos East District.

Other members of the households, in high economic stratum are less likely to reuse plastic waste than the heads of households in low economic stratum.

The female respondents in low economic stratum are less likely to make effort to reduce plastic generation than the male respondents in high economic stratum.

The female respondents in high economic stratum are less likely to encourage plastic waste scavenging than the male respondents in the low economic stratum.

Lagos East District households, in low economic stratum are less likely to treat separated plastic waste properly than those of Lagos West District, in high economic stratum.

The older age groups, in Lagos Central District, in low economic stratum are more likely not to sort waste for the fact that household has only one waste container than those younger age groups, in Lagos West District, in high economic stratum.

Households in the low nature of dwelling unit, in Lagos Central District, in low economic stratum are less likely to participate in plastic waste recycling than those in high dwelling units, in Lagos East District, in high economic stratum.

Low educated households, in low nature of dwelling unit, in Lagos Central District are less likely to be willing to participate in plastic waste separation in compliance with the Government's directive than those high educated, in high nature of dwelling unit, in Lagos East District.

Household with the low nature of dwelling unit, in Lagos Central District, in high economic stratum are less likely to believe that it is the responsibility of the Government and the citizens to ensure sustainable MSW than those of high dwelling unit, in Lagos East District, in low economic stratum. Meanwhile, there is a significant positive correlation ($N=218$) between responsibility to attain sustainable MWS management and increasing level of education ($\tau = 0.02, p < 0.05$).

Low educated older age groups are less likely to be willing to minimize plastic waste mismanagement than those high educated and the younger age group.

The households with the low nature of dwelling unit are less likely to accept the placement of ban on single – use plastics than those in high dwelling unit. There is also a significant positive correlation ($N=215$) between acceptance of ban on single – use plastic and educational status ($\tau = 0.017, p < 0.05$).

Lagos Central District households, in low economic stratum are less likely do without plastic use than those in Lagos West District, in high economic strata.

Households in the low nature of dwelling unit, in Lagos East District, in low economic stratum are less likely to properly dispose municipal solid waste than those of high dwelling unit, in Lagos Central District, in high economic stratum.

Households in the low nature of dwelling units, in low economic stratum are less likely to pay for waste disposal services than those in high dwelling unit, in higher economic strata.

Households in the low nature of dwelling unit, in Lagos West District, in low economic stratum are less likely to continue the payment of waste services than those in high dwelling unit, in Lagos Central District, in high economic stratum.

Household in the low nature of dwelling unit, in Lagos West and Central Districts, in low economic stratum, are less likely to have heard of PAKAM App than those in high dwelling unit, in Lagos East District, in high economic stratum. There is a significant positive correlation ($N=218$) between ever heard of PAKAM App and educational level ($\tau = 0.031, p < 0.05$).

Other members of the household, in low economic stratum are less likely to have ever used the PAKAM App than those heads of households in the high economic stratum. However, there is a significant negative correlation ($N=125$) between ever used the PAKAM App and increasing age ($\tau = 0.04, p < 0.05$).

Other members of the household, in Lagos Central District, in the high economic stratum are less likely not to have used the PAKAM App for the lack of knowledge on how to use it than the heads of households, in Lagos West District, in low economic stratum.

One of the findings showed that most existing waste management policies in the State were formulated without studies to provide the necessary information concerning the matter for which the interventions policies were planned for. The Lagos State government has made its intention to outrightly place a ban on single – use plastics, but it was suggested that a phased – ban should be considered. But before this phased – banning, it is recommended that study should be carried out to identify all the single – use plastic products in the Lagos market, determine their compositions, source, recyclability, among others to define the products that needed to be banned and classify them in phases of the ban. It is also recommended for further study to determine availability of raw materials for the production of bio – based plastics to

replace the petrochemical plastic; determine the cost and benefits of shifting to the use of alternative plastics.

Several types of plastic Deposit Refund Scheme (DRS) exist in practice across the globe, study to determine the one or the ones that will best suit the Lagos context should be carried out in detail. However, most existing DRSs are on plastic bottles but not on single – use plastic packaging materials, hence, research into this on how it can be established could be helpful.

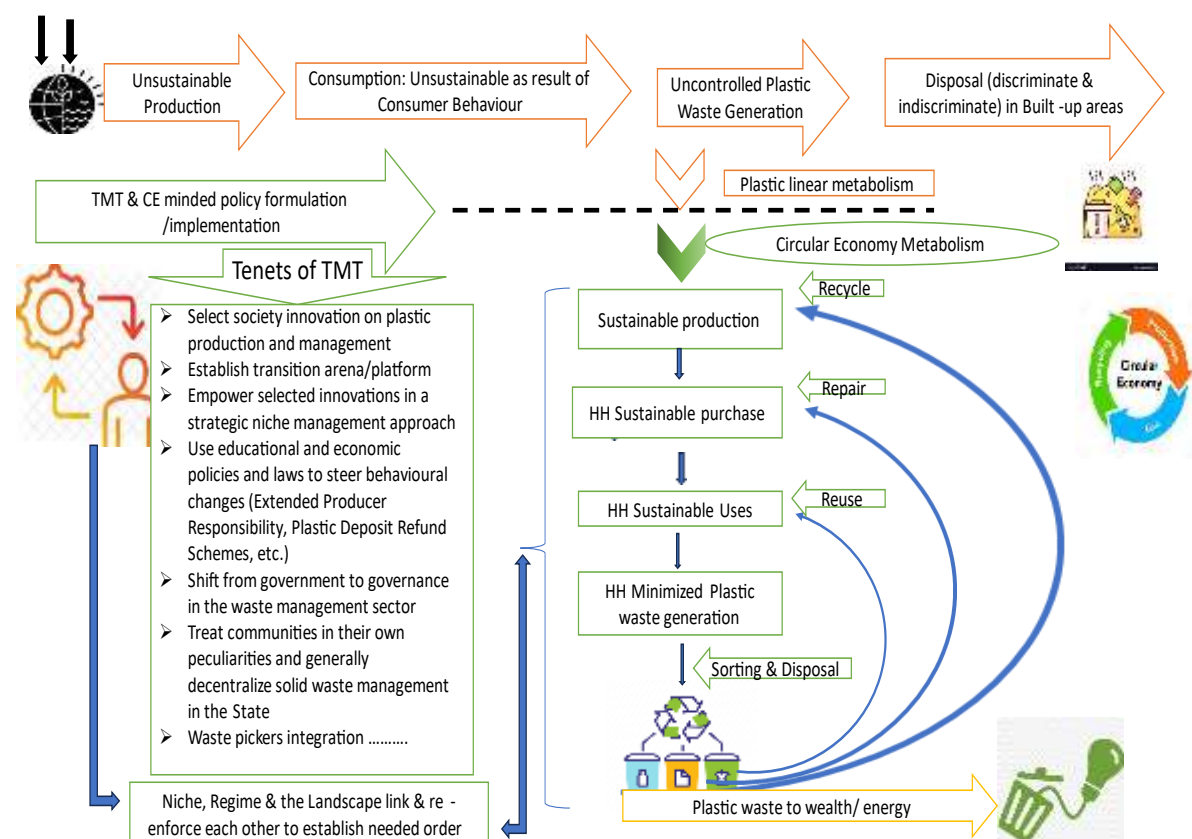
The study identified that the non – inclusion of the households in the planning stages of how to manage the waste generated in the city is one of the major factors hampering the transitioning to sustainable plastic waste management in the State. The sustainability roles of the households that could help accelerate the transition were identified among others, as well as useful information that could be followed for the formulation of more evidence – based policies for the sustainable management of plastic waste in the Lagos metropolis. The study showed some actions of the households that ran contrarily to the tenets of the Circular Economy concepts with respect to sustainable plastic waste management and those wrong approaches of the regulators in an attempt to enhance the transitioning. It is concluded that by applying the underlying tenets of the Transition Management Theory and the Circular Economy concept of plastic production, use, and waste management, the desired transition could be achieved with time. It is worthy to emphasize that no study has been conducted by combining the Transition Management Theory and the Circular Economy concept to understanding the problems of the plastic waste management situation in Lagos, Nigeria and in the end proffered probable solution pathways using the aforementioned economic concept and transition theory as guides (Figure 5.7).

In order to achieve a ‘just transitioning’ (all-inclusive and considerable measures engaged to end plastic pollution, for all stakeholders within the lifecycle of plastic) to sustainable plastic

waste management in the study area, a combination of the underlying principles of TMT and CE needed to be put in place. Just transition is part of a universally accepted right of human to a sustainable environment that must be clean and healthy to dwell in. It is an integral aspect of Sustainable Development Goal 8 (SDG 8) that relates to ‘decent work and economic growth’ and the assurance of justice in the implementation of plastic treaties. A well implemented just transition allows for better support from the public as the effected community are given ample opportunities to participate in planning towards reducing the plastic pollution by transiting from fossil fuel – based plastic production and the use to circular economy of plastic generally (cf. O'Hare et al., 2023).

Figure 5.7

Proposed Hybridization of TMT and CE Concept to Steer the Plastic Transition



Note. Proposed hybridization of TMT and CE concept to steer the plastic transition to establish sustainable plastic waste management in Lagos, Nigeria (Self – developed).

Consequently, ‘just circular economy’ of plastic connotes the idea of the socio – ecological situation aimed to a win – win state that puts the waste pickers and major generators of the waste (households) at the centre of the transition in trying to reduce plastic pollution burden on people and the environment, especially the marginalized individuals and communities (cf. O'Hare et al., 2023). Considering the immediate past, the informal sector of plastic waste pickers whose activities are considered illegal around the government – approved dumpsites must be reconsidered for integration into the main stream of solid waste management value chain to increase their social protection in Lagos. The recycling activities in Lagos are championed by the informal sector and SMEs where the driver is for economic reasons and these innovative activities must be recognized and steered in the right direction using tenets of TMT and CE to include environmental protection and social equity as drivers of innovations. This should be done with effort to also protect the right of the waste pickers and the down trodden along value chain of plastic.

To be able to escalate the observed niche sustainability innovations, the need to formulate evidence – based policy for the life cycle of plastic is necessary, with all major stakeholder involvement from planning to implementation and where the need arises, evaluation and assessment of the policy. With major stakeholders in plastic life cycle involvement and evidence – based sustainable plastic waste management policy put in place, a model of plastic management is proposed (Figure 5.7) combining TMT and Circular Economy Concept of plastic to steer the transition to establishing new socio – technical regime of sustainable plastic governance in Lagos, Nigeria.

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APPENDIX

Appendix A: Approved REAF-DS



**UNICAF UNIVERSITY
RESEARCH ETHICS APPLICATION FORM
DOCTORAL STUDIES**

UREC USE ONLY:

Application No:

Date Received:

Student's Name: OJOGUN, CLARKSON INUWA

Student's E-mail Address: clarksino@yahoo.com

Student's ID #: R1811D6650535

Supervisor's Name: REGINALD DENNIS GWISAI

University Campus: Unicaf University Zambia (UUZ)

Program of Study: UUZ: PhD Doctorate of Philosophy

Research Project Title: THE ROLE OF HOUSEHOLDS IN TRANSITIONING TO SUSTAINABLE
MANAGEMENT OF PLASTIC WASTE IN THE MEGA-CITY OF LAGOS, NIGERIA.

1. Please state the timelines involved in the proposed research project:

Estimated Start Date: 29-Jun-2020

Estimated End Date: 29-Sep-2022

2. External Research Funding (if applicable):

2.a. Do you have any external funding for your research?

☐

YES

☒

NO

If YES, please answer questions **2b** and **2c**.

2.b. List any external (third party) sources of funding you plan to utilise for your project. You need to include full details on the source of funds (e.g. state, private or individual sponsor), any prior / existing or future relationships between the funding body / sponsor and any of the principal investigator(s) or co-investigator(s) or student researcher(s), status and timeline of the application and any conditions attached.

2.c. If there are any perceived ethical issues or potential conflicts of interest arising from applying or and receiving external funding for the proposed research then these need to be fully disclosed below and also further elaborated on, in the relevant sections on ethical considerations later on in this form.

3. The research project

3.a. Project Summary:

In this section fully describe the purpose and underlying rationale for the proposed research project. Ensure that you pose the research questions to be examined, state the hypotheses, and discuss the expected results of your research and their potential.

It is important in your description to use plain language so it can be understood by all members of the UREC, especially those who are not necessarily experts in the particular discipline. To that effect ensure that you fully explain / define any technical terms or discipline-specific terminology (use the space provided in the box).

The intent of the proposed research is to investigate how the households have contributed to the extant unsustainable plastic waste management and contribute to deciphering how they could be integrated into the sustainable plastic waste management system to minimize plastic waste leakages. Thereby, maximize their involvement toward achieving sustainable plastic waste management in Lagos, Nigeria. The choice of household is based on the ground that they are the major generators of municipal solid waste that plastic waste is part of and without the buy-in of the households, it will be difficult to successfully implement a sustainable plastic waste management program.

The study will look at plastic waste management situation using the concept of circular economy as guiding framework in finding out how the practice is going contrary to these sustainable and economic management practices and to decipher how these practices can be re-aligned to a more sustainable form. Studies will generate information that could be used for 'evidence-based policy formulation in effort to bring to an end, the menaces caused by extant plastic waste management practice in the study area and contribute to enhancing economic growth.

Relevant tentative research questions that could be helpful in achieving the purposes of the study are as follows:

Main Research Questions

- i. How can the households be integrated in the value chain of solid waste management to play some sustainability management roles that could aid transitioning to sustainable plastic waste management in the study area?
- ii. How have the households managed municipal solid waste that could either have contributed to hindering or aided the transitioning process to sustainable solid waste management in Lagos, Nigeria?
- iii. Which strategies have been successfully applied for other megacities/countries in the management of plastic waste and how can some of these strategies be adopted and adapted to suit the Lagos/Nigeria context?

3.b. Significance of the Proposed Research Study and Potential Benefits:

Outline the potential significance and/or benefits of the research (use the space provided in the box).

The study will look at plastic waste management situation using the concept of circular economy as guiding framework in finding out how the practice is going contrary to these sustainable management practices and to decipher how these practices can be re-aligned to a more sustainable form. Studies along the line of waste management in the study area have not used this circular economy (to the best of my knowledge) as guiding concepts to generate information that could be used for 'evidence-based policy formulation in effort to bring to an end, the menaces caused by extant plastic waste management practice in the study area and enhance economic growth. In order not to remain in lock-in to the socio-technological syndrome of unsustainable management of plastic waste, it is necessary that this type of researches are carried to provide ideas to policy-makers on how best the society can be freed from the lock-in syndrome and proffer waste management that will bring about the achievement of social, economic and ecological benefits and help in fulfilling some aspects of Sustainable Development Goals (SDGs) in likes of Goal 3 (to ensure healthy lives and promote well-being for all at all ages), 6 (ensure availability and sustainable management of water and sanitation for all), 11 (make cities and human settlements inclusive, safe, resilient and sustainable), 12 (ensure sustainable consumption and production patterns), 14 (conserve and use the oceans, seas and marine resources in a sustainable manner), & 15 (manage forests sustainably to combat desertification, halt and reverse land degradation, halt biodiversity loss).

4. Project execution:

4.a. The following study is an:

- ☒ experimental study (primary research)
- ☐ desktop study (secondary research)
- ☐ desktop study using existing databases involving information of human/animal subjects
- ☐ Other

If you have chosen 'Other' please Explain:

4.b. Methods. The following study will involve the use of:

Method

Materials / Tools

Qualitative:

- ☒ Face to Face Interviews
- ☒ Phone Interviews
- ☒ Face to Face Focus Groups
- ☐ Online Focus Groups
- ☐ Other *

Quantitative:

- ☒ Face to Face Questionnaires
- ☐ Online Questionnaires
- ☐ Experiments
- ☐ Tests
- ☐ Other *

*If you have chosen 'Other' please Explain:

5. Participants:

5 a. Does the Project involve the recruitment and participation of additional persons other than the researcher(s) themselves?

- ☒ YES If YES, please complete all following sections.
- ☐ NO If NO, please directly proceed to Question [7](#).

5 b. Relevant Details of the Participants of the Proposed Research

State the number of participants you plan to recruit, and explain in the box below how the total number was calculated.

Number of participants

257

Lagos will be stratified following its political delineation into three Senatorial Districts which are, Lagos Central (Surulere, Apapa, Eti-Osa, Lagos Island & Mainland Local Government Areas-LGAs), Lagos East (Shomolu, Kosofe, Epe, Ibeju-Lekki & Ikorodu LGAs) and Lagos West (Agege, Ifako-ijaiye, Badagry, Ojo, Ajeromi-Ifeelodun, Amuwo-Odofin, Oshodi-Isolo, Ikeja & Mushin LGAs). These LGAs are further divided into Wards for easy of voting. These Wards have in most cases visible social stratification based on socio-economic factors and will be classified into highbrow area (exclusively rich) Mid-brow (middle class) & the Low-income area (the poor) for the purpose of the study. Three Districts (From each District, three wards will be sampled as highbrow, mid-brow and low-income area). For the self-administered questionnaire, 25 participants from each socio-economic strata. Three District, each having three selected wards of 25 participants. Total, 9 wards, 25 participants to arrive at 225..

Describe important characteristics such as: demographics (e.g. age, gender, location, affiliation, level of fitness, intellectual ability etc). It is also important that you specify any inclusion and exclusion criteria that will be applied (e.g. eligibility criteria for participants).

Age range

From

18

To

70

Gender



Female



Male

Eligibility Criteria:

- Inclusion criteria

Participants are Lagos State residents and are heads of household (male or female) or a householder and must be between the ages of 18 and 70 years and in a good state of mind to be able provide Informed Consent.
In the purposive selection for FGD, participated must be knowledgeable in waste management matters in the study area or by virtue of work schedule, have participated in policy formulation in the State or involved in plastic waste recycling or related issues. The length of stay in Lagos will also be considered in deciding who should participate.

- Exclusion criteria

Any person below 18 and above 70 years of age.
Anyone not residing in study area.
Anyone that cannot communicate well in any of the following languages - English, Pigin English, Ibo, Hausa (the proponent understands and speak these languages fluently) and Yoruba (language of the indigenes of the study area which the proponent understands not too well and thus might require translation where the need arises

Disabilities

Only participants who are mentally fit to provide informed consent for themselves will be recruited. Individuals who have a mental disability and are not in a position to provide their own consent will not participate in the study

Other relevant information (use the space provided in the box):

5 c. Participation & Research setting:

Clearly describe which group of participants is completing/participating in the material(s)/ tool(s) described in 5b above (use the space provided in the box).

225 = Self-administered questionnaire in a survey to capture opinion, belief, attitude, etc.

32 = Interview/FGD

- a. Staff MOE & WR (FGD 8 Participants)
- b. Staff LAWMA (FGD 5 Participants)
- c. Plastic Scavengers in Soulus (FGD 7 Participants)
- d. Plastic Scavengers in Olusosun Dumpsite (FGD 8 Participants)
- e. 2 Officials of Recovered Plastic Waste off-takers' company face to face interview
- f. 2 individuals interview with Staff of MOE & WR

5 d. Recruitment Process for Human Research Participants:

Clearly describe how the potential participants will be identified, approached and recruited (use the space provided in the box).

Would be participants will be contacted face to face to ask them to participate in the study, especially with the case of interviews with heads of households. For the FGD where person with knowledge on study phenomenon is needed, the participants will be reached on face to face and where that is not possible, they will be contacted through phone call to discuss or book appointment. Having their contacts will not be an issue as most targeted will be Lagos State Government Officials whose responsibility it is to manage and formulate policies for waste management in the study. Some of these would be participants from Lagos Waste Management Authority have contacts of most legal plastic recyclers in the State. Others in the value chain of plastic recovery, re-use can be reached through their trade associations. A clear and simple consent form will be designed informing the intended participants about the study at hand, letting them know that participation is not a must and that they may decide to opt-out of the study at any time, assuring anonymity where necessary, making sure that how the researcher can be contacted is clearly spelt out, and ensuring that the participants are not in any way deceived nor necessary information denied them amongst others.

5 e. Research Participants Informed Consent.

Select below which categories of participants will participate in the study. Complete the relevant Informed Consent form and submit it along with the REAF form.

Yes	No	Categories of participants	Form to be completed
☒	☐	Typically Developing population(s) above the maturity age *	Informed Consent Form
☐	☒	Typically Developing population(s) under the maturity age *	Guardian Informed Consent Form

* Maturity age is defined by national regulations in laws of the country in which the research is being conducted.

5 f. Relationship between the principal investigator and participants.

Is there any relationship between the principal investigator (student), co-investigators(s), (supervisor) and participant(s)? For example, if you are conducting research in a school environment on students in your classroom (e.g. instructor-student).

☒ YES ☐ NO

If YES, specify (use the space provided in the box).

The principal investigator is a staff of the Lagos State Civil Service, who have spent two decades at the Lagos State Ministry of the Environment and Water Resources (MOE & WR) . Some civil servants (no direct reporting line with the principal investigator, no hierarchical relationship between the researcher and the participants) will be participants in various capacities in research; reaching out to them and other related government agencies will not pose any problem as the menaces caused by the poor management of plastic waste is having a growing concern, which was further popularized by 2018 World Environment Day theme of "Beat Plastic Pollution".

6. Potential Risks of the Proposed Research Study.

6 a. i. Are there any potential risks, psychological harm and/or ethical issues associated with the proposed research study, other than risks pertaining to everyday life events (such as the risk of an accident when travelling to a remote location for data collection)?

☐ YES ☒ NO

If YES, specify below and answer the question 6 a.ii.

6 a.ii Provide information on what measures will be taken in order to exclude or minimise risks described in 6.a.i.

6 b. Choose the appropriate option

		Yes	No
i.	Will you obtain written informed consent form from all participants?	☒	☐
ii.	Does the research involve as participants, people whose ability to give free and informed consent is in question?	☐	☒
iii.	Does this research involve participants who are children under maturity age? If you answered YES to question iii, complete all following questions. If you answered NO to question iii, do not answer Questions iv, v, vi and proceed to Questions vii, viii, ix and x.	☐	☒
iv.	Will the research tools be implemented in a professional educational setting in the presence of other adults (i.e. classroom in the presence of a teacher)?	☐	☐
v.	Will informed consent be obtained from the legal guardians (i.e. parents) of children?	☐	☐
vi.	Will verbal assent be obtained from children?	☐	☐
vii.	Will all data be treated as confidential? If NO, explain why confidentiality of the collected data is not appropriate for this proposed research project, providing details of how all participants will be informed of the fact that any data which they will provide will not be confidential.	☒	☐
viii.	Will all participants /data collected be anonymous? If NO, explain why and describe the procedures to be used to ensure the anonymity of participants and/or confidentiality of the collected data both during the conduct of the research and in the subsequent release of its findings.	☒	☐

		Yes	No
ix.	Have you ensured that personal data and research data collected from participants will be securely stored for five years?	☒	☐
x.	Does this research involve the deception of participants? If YES, describe the nature and extent of the deception involved. Explain how and when the deception will be revealed, and who will administer this debrief to the participants:	☐	☒

6 c. i. Are there any other ethical issues associated with the proposed research study that are not already adequately covered in the preceding sections?

☐ Yes ☒ No

If YES, specify (maximum 150 words).

6.c.ii Provide information on what measures will be taken in order to exclude or minimise ethical issues described in 6.c.i.

6 d. Indicate the Risk Rating.

☐ High ☒ Low **LOW RISK**

7. Further Approvals

Are there any other approvals required (in addition to ethics clearance from UREC) in order to carry out the proposed research study?

☐ YES ☒ NO

If YES, specify (maximum 100 words).

8. Application Checklist

Mark ✓ if the study involves any of the following:

- ☐ Children and young people under 18 years of age, vulnerable population such as children with special educational needs (SEN), racial or ethnic minorities, socioeconomically disadvantaged, pregnant women, elderly, malnourished people, and ill people.
- ☐ Research that foresees risks and disadvantages that would affect any participant of the study such as anxiety, stress, pain or physical discomfort, harm risk (which is more than is expected from everyday life) or any other act that participants might believe is detrimental to their wellbeing and / or has the potential to / will infringe on their human rights / fundamental rights.
- ☐ Risk to the well-being and personal safety of the researcher.
- ☐ Administration of any substance (food / drink / chemicals / pharmaceuticals / supplements / chemical agent or vaccines or other substances (including vitamins or food substances) to human participants.
- ☐ Results that may have an adverse impact on the natural or built environment.

9. Further documents

Check that the following documents are attached to your application:

		ATTACHED	NOT APPLICABLE
1	Recruitment advertisement (if any)	☐	☒
2	Informed Consent Form / Guardian Informed Consent Form	☒	☐
3	Research Tool(s)	☒	☐
4	Gatekeeper Letter	☐	☒
5	Any other approvals required in order to carry out the proposed research study, e.g., institutional permission (e.g. school principal or company director) or approval from a local ethics or professional regulatory body.	☐	☒

10. Final Declaration by Applicants:

- (a) I declare that this application is submitted on the basis that the information it contains is confidential and will only be used by Unicaf University for the explicit purpose of ethical review and monitoring of the conduct of the research proposed project as described in the preceding pages.
- (b) I understand that this information will not be used for any other purpose without my prior consent, excluding use intended to satisfy reporting requirements to relevant regulatory bodies.
- (c) The information in this form, together with any accompanying information, is complete and correct to the best of my knowledge and belief and I take full responsibility for it.
- (d) I undertake to abide by the highest possible international ethical standards governing the Code of Practice for Research Involving Human Participants, as published by the UN WHO Research Ethics Review Committee (ERC) on <http://www.who.int/ethics/research/en/> and to which Unicaf University aspires to.
- (e) In addition to respect any and all relevant professional bodies' codes of conduct and/or ethical guidelines, where applicable, while in pursuit of this research project.



I agree with all points listed under Question 10

Student's Name: OJOGUN, CLARKSON INUWA

Supervisor's Name: REGINALD DENNIS GWISAI

Date of Application: 11-Oct-2021

Important Note:

Save your completed form (we suggest you also print a copy for your records) and then submit it to your UU Dissertation/project supervisor (tutor). **In the case of student projects, the responsibility lies with the Faculty Dissertation/Project Supervisor.** If this is a student application, then it should be submitted via the relevant link in the VLE. Please submit only electronically filled in copies; **do not** hand fill and submit scanned paper copies of this application.

Informed Consent Form

Part 1: Debriefing of Participants

Student's Name: OJOGUN, CLARKSON INUWA

Student's E-mail Address: clarksino@yahoo.com

Student ID #: R1811D6650535

Supervisor's Name: REGINALD DENNIS GWISAI

University Campus: Unicaf University Zambia (UUZ)

Program of Study:

Research Project Title: THE ROLE OF HOUSEHOLDS IN TRANSITIONING TO SUSTAINABLE PLASTIC WASTE MANAGEMENT IN THE MEGA-CITY OF LAGOS, NIGERIA.

Date: 11-Oct-2021

Provide a short description (purpose, aim and significance) of the research project, and explain why and how you have chosen this person to participate in this research (maximum 150 words).

The study will critically investigate the contemporary social phenomenon of unsustainable plastic waste management in Lagos State to gather information that could be used to initiate actions towards achieving globally acceptable level of sustainable solid/plastic waste management by households.

The study will help to decipher how best the households could be incorporated into the sustainable plastic waste management program to play certain roles that could aid the transitioning process. Using Circular Economy concept as guide, the generated information could be used for 'evidence-based policy formulation in effort to bring to an end, the menaces caused by extant plastic waste management practice while enhancing economic growth.

The participants will be chosen either for the fact they are members of a household within the sample population and are between 18 to 70 years, others are because of their perceived knowledge around the topic of study and the job types as may be related to plastic recycling/management.

The above named Student is committed in ensuring participant's voluntarily participation in the research project and guaranteeing there are no potential risks and/or harms to the participants.

Participants have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In these cases, data collected will be deleted.

All data and information collected will be coded and will not be accessible to anyone outside this research. Data described and included in dissemination activities will only refer to coded information ensuring beyond the bounds of possibility participant identification.

I, OJOGUN, CLARKSON INUWA, ensure that all information stated above is true and that all conditions have been met.

Student's Signature: Ojogun C. I.

Informed Consent Form**Part 2: Certificate of Consent**

This section is mandatory and should to be signed by the participant(s)

Student's Name: OJOGUN, CLARKSON INUWA

Student's E-mail Address: clarksino@yahoo.com

Student ID #: R1811D6650535

Supervisor's Name: REGINALD DENNIS GWISAI

University Campus: Unicaf University Zambia (UUZ)

Program of Study:

Research Project Title: THE ROLE OF HOUSEHOLDS IN TRANSITIONING TO SUSTAINABLE
PLASTIC WASTE MANAGEMENT IN THE MEGA-CITY OF LAGOS, NIGERIA.

I have read the foregoing information about this study, or it has been read to me. I have had the opportunity to ask questions and discuss about it. I have received satisfactory answers to all my questions and I have received enough information about this study. I understand that I am free to withdraw from this study at any time without giving a reason for withdrawing and without negative consequences. I consent to the use of multimedia (e.g. audio recordings, video recordings) for the purposes of my participation to this study. I understand that my data will remain anonymous and confidential, unless stated otherwise. I consent voluntarily to be a participant in this study.

Participant's Print name:

Participant's Signature:

Date:

If the Participant is illiterate:

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had an opportunity to ask questions. I confirm that the aforementioned individual has given consent freely.

Witness's Print name:

Witness's Signature:

Date:

SURVEY QUESTIONNAIRE

You are invited/requested to complete the following questionnaire which aims at examining *'The Role of Households in Transitioning Sustainable Plastic Waste Management in Megacity of Lagos State, Nigeria'* for an academic purpose in partial fulfillment of the award of Doctorate of Philosophy (PhD) degree by the Unicaf University, Zambia. The findings could also be useful for the formulation of evidence-based policy on sustainable plastic waste management in Lagos State.

The questionnaire should only take 30 minutes to complete and it includes **41** questions. Your responses are **anonymous** and will not be identified with you in any way. By participating in this survey, you are indicating that you understand that your responses are **anonymous** and will not be identified with you in any way. You may skip any question that you find intrusive or offensive, but it will help me if you respond to as many questions as you feel comfortable with.

You have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In this case, the data collected will be deleted.

Please complete all questions and make sure you follow the instructions for each question.

A Demographic and socio-economic characteristic of Respondent (Tick one Box)

1. Gender

- ☐ a. Male
- ☐ b. Female
- ☐ c. Prefer not to say

2. Age Range

- ☐ a. 18-29
- ☐ b. 30-39
- ☐ c. 40-49
- ☐ d. 50-59
- ☐ e. 60-70
- ☐ f. Not interested

3. Highest Educational Institution Attended

- ☐ a. None
- ☐ b. Primary
- ☐ c. Secondary
- ☐ d. Tertiary
- ☐ f. None of the mentioned

4. Householder's Position; are you the Head of the Household?
- ☐ a. Yes
- ☐ b. No
5. Nature of Household
- ☐ a. One person Household
- ☐ b. Two (2) Persons
- ☐ c. More than Two (2) persons
6. Nature of Dwelling Unit
- ☐ a. Room system
- ☐ b. Self-Contain (room & a parlor, toilet, kitchen inclusive)
- ☐ c. Flat system
- ☐ d. Duplex
- ☐ e. Terrace
- ☐ d. No dwelling unit
7. Area of Residence (Fill in the blank spaces)
- Street.....Nea
- rest Bus-stop.....
- LGA/LCDA.....

B. Knowledge of Solid Waste/Generation/Management (Thick one Box)

1. Do you generate municipal solid waste in your household?
- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know
- If your answer to Question (Q) **B1** is 'Yes', proceed to question B2, but if 'No' or 'I don't know', please proceed to question **QB5**
2. How do you temporarily store the solid waste?
- ☐ a. Waste bin
- ☐ b. Waste bag
- ☐ c. Carton pack
- ☐ d. No temporary storage of waste within the dwelling unit
3. Is plastic waste part of waste generated in your household?
- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know

4. How do you dispose of your plastic waste?
- ☐ a. Put in the same waste bin/bag with other waste types
 - ☐ b. Put in a separate waste bin/bag/container for further re-use
 - ☐ c. Throw it away as I considered convenient
 - ☐ d. Separate it for recyclers to pick
 - ☐ d. I don't know
5. Have you ever seen plastic material or product?
- ☐ a. Yes
 - ☐ b. No
 - ☐ c. I don't know
6. Have you ever used any plastic material/product?
- ☐ a. Yes
 - ☐ b. No
 - ☐ c. I don't know
7. How often do you use plastic materials?
- ☐ a. Dailly
 - ☐ b. Weekly
 - ☐ c. Monthly
 - ☐ d. Yearly
 - ☐ e. Never
8. How often do you buy plastic materials?
- ☐ a. Dailly
 - ☐ b. Weekly
 - ☐ c. Monthly
 - ☐ d. Yearly
 - ☐ e. Never
9. Have you seen plastic waste in open places in Lagos?
- ☐ a. Yes
 - ☐ b. No
 - ☐ c. I don't know

10. Which of the public places did you notice/see plastic waste in the Lagos? (**Multiple options could be selected**)
- ☐ a. Street/Road
 - ☐ b. Gutter/Drainage channels
 - ☐ c. Floating on water bodies
 - ☐ d. Parks & gardens
 - ☐ e. Bushes
 - ☐ f. Market places
11. Where the given answer to QB9 above is 'Yes', then, does it look good to have plastic waste in such public places?
- ☐ a. Yes
 - ☐ b. No
 - ☐ c. I don't know
 - ☐ d. I don't care
12. Are you aware of the environmental problems associated with plastic waste mismanagement in Lagos?
- ☐ a. Yes
 - ☐ b. No
13. If your answer to QB11 is 'Yes', which of the issues listed below is associated to plastic waste mismanagement? (**Multiple answers could be selected**)
- ☐ a. Littering of environment.
 - ☐ b. Blockage of drainage channels.
 - ☐ c. Pollution of water bodies (stream, river, sea, ocean).
 - ☐ d. Destruction of the natural beauty of the environment.
 - ☐ e. Land/forest pollution.
 - ☐ f. Death of animals living in the water.
 - ☐ g. Human health problems
 - ☐ h. All of the above
 - ☐ i. None of the above
14. What do you know concerning the degradability (ability to naturally decay with time) of plastic materials?
- ☐ a. They are degradable
 - ☐ b. They are non-degradable
 - ☐ c. I don't know

C. Perception and Attitude towards Sustainable Plastic Waste Management

1. Do you think that there is need or it is important to better manage this plastic waste to avoid or reduce the problems associated with their mismanagement?
☐ a. Yes
☐ b. No.
☐ c. I don't know
☐ d. I don't care
2. Do you think plastic wastes have economic value?
☐ a. Yes
☐ b. No
☐ c. I don't know
☐ d. I don't care
3. Do you sometimes reuse your generated plastic waste?
☐ a. Yes
☐ b. No
4. Have you made any effort to reduce the quantity of plastic waste that you generate?
☐ a. Yes
☐ b. No
☐ c. I don't know
5. What is your opinion concerning plastic waste scavenging or recovering?
☐ a. Should be encouraged
☐ b. Should be discouraged
☐ c. I am indifferent
6. Do you separate plastic waste from other waste in your household?
☐ a. Yes
☐ b. No
7. If your answer to QC6 is 'Yes', what do you do with separated plastic waste afterward?
☐ a. Sell it
☐ b. Dispose like other waste
☐ c. Reuse it where needed/necessary
☐ d. Give it out to those who needed it
☐ e. Give it to LAWMA and her agents

8. If answer to QC6 is 'No', why is it that you don't separate plastic waste?

- ☐ a. No law requesting for the separation of plastic waste in Lagos
- ☐ b. I see no reason to separate plastic waste
- ☐ c. Household only has or use one container for storing waste
- ☐ d. Separating waste is difficult
- ☐ d. Separating waste is an extra cost to the household
- ☐ e. Don't know where to sell the separated plastic waste
- ☐ f. Others (kindly state)

D. Willingness to Participate in Sustainable Management of Solid/Plastic Waste

1. If plastic waste recycling happens to be part of recommendations to overcome plastic waste mismanagement in Lagos, will you participate?

- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know

2. If you are asked to separate plastic waste from other waste in your household, will you do that?

- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't Know

3. Sustainable management of plastic waste in Lagos should be the responsibility of ...?

- ☐ a. Solely the Government
- ☐ b. Solely the inhabitants
- ☐ c. The Government and the Citizenry/inhabitants

4. Will you be willing to participate in Government's program geared towards minimizing plastic waste mismanagement problems in Lagos?

- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know

5. Lagos State Government wants to ban single-use plastics (straw, plastic bags, plastic bottles, wrapper, disposable plastic materials, etc.), will you be committed to such ban?

- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know

6. Can you do without the use of Plastic products?
- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know
7. How do you dispose municipal solid waste in your household?
- ☐ a. Through PSP Operators
- ☐ b. Through cart pushers
- ☐ c. Dump them on public places like road, open spaces or drainages
- ☐ d. Burn the waste
- ☐ e. Compost it to manure
8. Does your household pay for waste service charges to Government approved PSP?
- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know
9. Do you think residences should continue paying for waste service charges in Lagos?
- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know
- ☐ c. I don't know
10. Have you heard of PAKAM plastic recycling App?
- ☐ a. Yes
- ☐ b. No
- ☐ c. I don't know
11. If your answer to QD10 is 'Yes', have you used the App?
- ☐ a. Yes
- ☐ b. No
12. If your answer to QD11 is 'No', why have you not used it?
- ☐ a. I don't know how to use it
- ☐ b. I am not interested in its used
- ☐ c. I have nothing to do with plastic recycling
- ☐ d. Plastic recycling is not profitable in small scale
- ☐ e. Others (kindly state).....
-
-

Date.....

Thanks for your valuable time

Enumerator: Ojogun Clarkson (08033555527)

Sampling Strategy for Data gathering through Questionnaire Administration to Householders (Cross-Sectional Survey)

Lagos is stratified following its political delineation into three Senatorial Districts which are, Lagos Central (Surulere, Apapa, Eti-Osa, Lagos Island & Mainland Local Government Areas-LGAs), Lagos East (Shomolu, Kosofe, Epe, Ibeju-Lekki & Ikorodu LGAs) and Lagos West (Agege, Ifako-ijaiye, Badagry, Ojo, Ajeromi-Ifelodun, Amuwo-Odofin, Oshodi-Isolo, Ikeja & Mushin LGAs). These LGAs are further divided into Wards for easy of voting. These Wards have in most cases visible social stratification based on socio-economic factors and will be classified into highbrow area (exclusively rich) Mid-brow (middle class) & the Low-income area (the poor) for the purpose of the study. **Three Districts (From each District, three wards will be sampled as highbrow, mid-brow and low-income area).** For the self-administered questionnaire, 25 participants from each socio-economic stratum. Three Districts, each having three selected wards of 25 participants. Totaling 9 wards, 25 participants for each ward to arrive at 225 respondents.

Other Variables

Demographic and socio-economic characteristic of Respondents

Knowledge of Solid Waste/Generation/Management

Perception and Attitude towards Sustainable Plastic Waste Management

Willingness to Participate in Sustainable Management of Solid/Plastic Waste

INTERVIEW MANUAL FOR GOVERNMENT OFFICIALS RESPONSIBLE FOR SOLID WASTE POLICY FORMULATION AND MANAGEMENT IN LAGOS STATE

Introduction

1. Name of Government Ministry/Authority/Agency
2. Department.....
3. Approximate Years of Service.....

A. Solid Waste Management Rules and Regulations

- i. Are there by-law(s) for municipal solid waste management in the State?
- ii. Where by-laws exist, which ones are they and when were they passed?
- iii. How relevant are the by-laws to the current waste management issues in Lagos and the globally acceptable solid waste management practices?
- iv. Which of the government Ministry/Authority/Agency are responsible for the formulation of by-laws for the management of municipal solid waste?
- v. In general, what does the extant solid waste management law hold for
 - Waste containerization and type(s) of containerization
 - Waste separation at source/household
 - What are the roles of the households as provided by the law?
 - Non-compliance to solid waste service charge payment?
 - The indiscriminate dumping of waste in the Metropolis
- vi. What effort have been put in place for the sustainable management of plastic waste in State
- vii. How effective do you think the efforts have been?
- viii. What can be done to improve upon the extant plastic waste management practice and governance in the State?

B. Stakeholders in Plastic Waste Management

- i. How have the householders contributed to plastic waste mismanagement in the State?
- ii. To what extent have the households been integrated into the plastic waste management plans of the state?
- iii. What ways do you think the householders could be incorporated into the solid waste management plans so as to achieve sustainability in plastic waste management?
- iv. What roles have the informal sector played in management of plastic? Whether negative or positive.
- v. How have the formal sector contributed to the present state of plastic waste management?

C. Future of Plastic Production and Management

- i. In aiming toward sustainable management of plastic waste, what roles should the plastic producers play?
- ii. In what ways can the current scavenging of plastic waste be minimized at the dumpsites?
- iii. How have the Government and its MDAs encouraged to maximize the informal sector involvement in plastic waste recovery and recycling?

INTERVIEW MANUAL FOR PLASTIC WASTE SCAVENGERS AND MERCHANTS AT OLUSHOSUN, OJOTA AND SOLUS, IGANDO DUMPSITES

A. Dumpsite Waste Picker at Olushosun/Solus

1. How long have you been picking plastic waste at the dumpsite?
2. Why are you engaged in plastic waste scavenging at the dumpsite?
3. Is your activity here able to take care of the basic needs of you and your immediate family?
4. How profitable is the business of plastic waste scavenging at the dumpsite?
5. Do you pay some money before you can pick plastic waste at the dumpsite?
6. Are you permitted to pick other waste types at the dumpsite?
7. What must a new comer to the dumpsite do first before the person is allowed to scavenge plastic waste at the dumpsite?
8. Are you a member of any association at this dumpsite?
9. Do you have leaders in plastic waste picking at the dumpsite?
10. What is the average quantity of plastic waste that you pick per day in kilograms?
11. Who do you sell your picked plastic waste to?
12. When do you usually sell the plastic, is it every day, weekly, monthly or when you have accumulated enough or when the buyers are ready?
13. How can you graduate to become a merchant rather than a pick?
14. How important do you think your activities here contribute to environmental protection?
15. In what ways has the Government recognize your activities here?

B. Plastic Waste Merchants at Olushosun/Solus Dumpsite

1. Where you once a plastic waste picker in Lagos?
2. How long have you been in this business of buying and selling plastic waste?
3. What other recovered materials do you usually buy here, if any?
4. How do you come about plastic waste buying and accumulation for bulk selling?
5. Who are those that you particularly buy the recovered plastic waste from?
6. How can a new comer in this dumpsite become a plastic waste merchant?
7. Are there any group of people at this dumpsite that determines who can buy or sell plastic waste?
8. Who are your major costumers that you sell your accumulated plastics to?
9. What quantities of plastic do you sell at a go and how often is that done?