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Integration of Household Communities in Solid Waste Management Systems: A Case of Suburban Households of Lagos state, Nigeria

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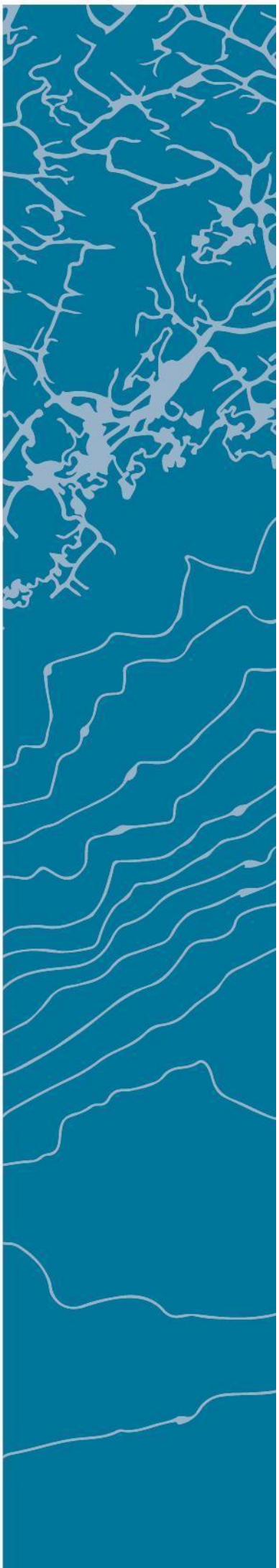

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ABSTRACT

Humans are said to be the only aspect of the ecosystem that emits trash and harms the ability of the environment to survive. The growing human and economic activities, which frequently generate waste, appear to have a significant negative impact on environmental sustainability. When solid waste is not adequately contained, it endangers both human and environmental sustainability. Solid waste solutions, which appear to include municipal collection, sorting, recycling, and waste secondary use, are central to household activities at the source. In a densely populated city like Lagos, inadequate management of household solid waste can pose challenges to societal development. The purpose of this research is to investigate coproduction in solid waste management with household communities in Lagos. As a result, semi-structured telephone interviews with selected participants produced the primary data which was analysed using emerging themes. Telephone calls lasting between 25 and 45 minutes were used to contact the participants. A total of eighteen interviewees from the three study groups participated. Five officers from the Lagos State Waste Management Authority (LAWMA), two operators from the Private Sector Participants (PSP), and eleven household members participated. The participation ratio was used to gain more information from households. As they are the independent category that the research seeks to investigate grounds for more active inclusion. According to a general finding in this report, the concept of coproduction proved to be an effective framework for carrying out the current study. The analytical themes within the study, indicated areas where coproduction can be effectively explored to achieve the integration of household communities in solid waste management systems of Lagos. They include- waste management administration, entrepreneurship and technology in waste management, and communicative engagement. This study concludes that active household participation is beneficial for sustainable waste management practises, with which society can identify and feel a greater sense of ownership. Furthermore, the study was able to identify current limitations for future research. Several policy recommendations emerged during the research process that policymakers should consider.

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LISTS OF ABBREVIATIONS

GN: Guardian Newspapers

IBR: International Bank for Reconstruction

ICT: Information and Communication Technology

IPCC: Intergovernmental Panel on Climate Change

ISWMS: Integrated Solid Waste Management Systems

ISWM: Integrated Sustainable Waste Management

LAWMA: Lagos Waste Management Authority

LSRDB: Lagos State Refuse Disposal Board

MSWM: Municipal Solid Waste Management

NESREA: The National Environmental Standards and Regulations Enforcement Agency

NNREC: Norwegian National Research Ethics Committees

NSD: Norwegian Centre for Research Data

PESTEL: Political, Economic, Social, Technological, Legal and Environmental factors

PSP: Private Sector Participants

SWMS: Solid Waste Management Systems

UN: United Nations

UNEP: United Nations Environment Programme

UNICEF: The United Nations Children's Fund

UNSD: United Nations Statistics Division

VN: Vanguard News

WB: The World Bank

WHO: World Health Organisation

CHAPTER ONE: INTRODUCTION

1.1 Background and Introduction

This report attempts to investigate and expertly present the topical issue of solid waste management within a specified context. The interest in solid waste originates from the research student's curiosity about sustainable administration, in both private and public spheres of the environment. In addition, the research student has nurtured an ambition to professionally contribute to the administration of sustainable societal systems. Furthermore, the study is carried out to fulfil the academic requirement for a master's degree in global development and planning, specialising in development management. The following introductory discourse will focus on the study background in waste management and other possible implications for current sustainability issues.

From the archival reports of the United Nations Environment Programme (2015), Municipal Solid Waste Management (MSWM) can be traced to the cholera epidemics that hit Europe and North America in the 1830s. The fact that more diseases could spread from trash that was decomposing, revolutionised the collection and removal of solid waste within the ancient cities. In this way, solid waste, which is what people don't want or need anymore and throw away as trash, should be managed as a basic human need and even a "basic human right" (UNEP, 2015). However, among current climate disasters and even pandemic inequality issues (Benach, 2021; Modi & Hanson, 2021), solid waste threatens both human and environmental sustainability when it is not adequately contained. Following the landmark of the Millennium Development Goals (MDGs), the post-2015 sustainability goals were initiated and aimed at ensuring the long-term well-being of our planet and its people (UN n.d.). Accordingly, sustainable development aims to meet the needs of present generations, without compromising the rights of future generations to fulfil their needs (UN, 2019). Admittedly, sustainability aspirations have been often called out and heavily criticised for being universal, broadly framed, inconsistent and difficult to quantify, or even implement or monitor (Bali Swain & Yang-Wallentin, 2020). The adoption of the agenda during the climate conference in Paris, inspired a series of events in 2015 aimed at cutting global emissions, widely referred to as COP-21 (Martin, 2015a). Consequently, the 17 Sustainable Development Goals (SDGs) address the social, economic, and environmental dimensions in which waste management is well embedded

(UNEP, 2018). Solid waste, among other waste streams, is relevant to SDGs 1- No poverty, 8- Decent work and economic growth, 9- industry, innovation, and infrastructure, 11- sustainable cities and communities; and 12- sustainable consumption and production (UNEP, 2018). Therefore, ensuring proper sanitation and waste management sits alongside the provision of potable water, shelter, food, energy, transport, and communications as essential to the economic as well as socio-political environment. As a result, solid waste management, among other sources of waste management, happens to be one of the several intersections to address social, economic, human as well as the inclusion of environmental development (Martin, 2015a).

Every year, an estimated 11.2 billion tonnes of solid waste is collected worldwide, and the decay of the organic proportion of solid waste negatively impacts the environment (UNEP, 2017). The IPCC estimates that solid waste management accounted for around 3% of global emissions in 2010, with most of that attributable to methane emissions from landfill sites (IPCC, 2022). Poor solid waste collection and management causes air and water pollution, as well as marine litter, and contributes to climate challenges (UN-Habitat, n.d.). Due to what is at stake in the long term, there is a need for effective measures towards mitigation and adaptation, as environmentally sound waste management is one of the key elements for sustainable development (UNEP, 2015). Reducing carbon emissions will involve using materials more efficiently, reusing and recycling products, and minimising waste (IPCC, 2022). Ample waste and resource management potentially contributes to mitigating climate change (UNEP, 2015). A sustainable solid waste management system (SWMS) depends, to a large extent, on available financial resources and the cooperation of the local population to apply waste minimization principles (Al-Khateeb et al., 2017). Some emerging economies have made great strides in their solid waste management systems, but there is still a long way to go in many other places (UNEP, 2015).

Generally, the rising volume and complexity in the movement and production of trash have been discussed as being linked with the modern economy and its significant risk to ecosystems as well as human health (Guerrero et al., 2013). This can also contribute to the emission of diseases, as well as toxic carbon in the surrounding air, water, and land (U.N., 2012). Therefore, the lack of an adequate solid waste management system can escalate socio-economic and environmental marginalisation. Such deprivation continues to show up in societies that don't have the right tools to set up structures for better waste management (West, 2016). Nevertheless, most of these growing societies are faced with the increasing

challenge of urbanisation, and the impact of globalisation often drives production and consumption patterns to produce carbon emissions from most national landfills (UN, 2020; WB, 2022). Even though a greater proportion of the world's most vulnerable countries have contributed the least to climate change, they seem to be at greatest risk from its negative effects and the least equipped to withstand and adapt to mitigate the challenges (Martin, 2015b). As this can be seen in many low and middle-income countries, where the solid waste management system remain weak and lack standardisation (Sundaravadivel & Vigneswaran, 2003). Alternatively, other reports confirm that this situation is improving for a change. Considering the existing informal state of the SWMS in these contexts, about 15 % of waste emissions are able to be reduced and more households are identified to be more willing to contribute the local cost for adequate waste evacuation (Diaz & Otoma, 2014; Ezebilo, 2013). These reports reveal a gradual progress in developing sustainable solid waste management system, however, other issues tend to persist. In ensuring that everyone has access to waste collection services, avoiding uncontrolled waste disposal and burning, and moving toward more environmentally friendly waste management, low- and middle-income nations still face numerous waste and human challenges (Massoud et al., 2021; UNEP, 2015).

Humans are said to be the only aspect of the ecosystem that emits trash and harms the environment's ability to stay alive (Friedrich & Trois, 2016; UNEP, 2018). Increasing human and economic activities that often produce waste, seem to have a considerable negative impact on environmental sustainability. The report from the United Nations (2012) stated that solid waste management systems risk struggling with the pace of human consumption and economic production limits. This seems like a relevant discussion to have as the global middle class is also slated to expand from two billion people to 4.9 billion by 2030, and is expected to consume more resource-intensive goods (U.N., 2012). Therefore, it appears that population trends, urbanisation, and economic development can escalate trash difficulties around the world, and Africa, for example, may soon overtake the conventional high-income countries, which account for almost half of all current waste emissions (UNEP, 2015). In Africa, Nigeria, for instance, has an estimated population of over 200 million people and the numbers continue to rise (GN, 2018). It is unknown if the population of major cities like Lagos in Nigeria is likely to double in two decades, altering the local political priority allocated to garbage if civil activities clash over waste management issues (UNEP, 2015). Which can occur if waste piles continue to litter and

bring havoc of pest and diseases to the environment or infect the human race with illnesses that can result in epidemics, more so, pandemic as we have it in the world today. Alternatively, such a case can also arise from waste dumps and unsanitary landfills around household communities. Which often emanates from the linear consumption and production patterns in most waste disposal systems (UNEP, 2015). The linear patterns in waste management tends to collect industrialised household solid waste and deposit them in national landfills where they decompose and emit toxic greenhouse gases (GHG) like carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) that pollute the environment and are also described to be toxic for the long-term existence of the planet (Couth, 2011; UNEP, 2018). To a large extent, this is similar to how it is for waste management in most countries that are without a functional or efficient solid waste management system. It is however found to be more common in densely populated countries with lower income levels, higher levels of open dumping, and burning of waste (Wilson et al., 2013).

Such a waste situation can result in a double environmental and human crisis. On one hand, the rising economic activity discussed earlier, can extract and deplete natural endowments for production ends. Thereby, impacting the environment negatively by also producing waste emissions which intensify environmental degradation. On the other hand, economic consumption patterns can negatively increase waste levels that are toxic to human health, and the rising population can further drive scarcity of economic resources, which often results in conflicts of human and environmental depletion (West, 2016). This can impact urban socio-cultural stability, impede economic growth; and possibly obstruct better waste management in the study area or lead to over reliance on the natural environment to contain waste discharge (Das et al., 2019). In addition, it also implies that a sustainable environment is crucial for both economic and human development. Sustainable solid waste management can cut greenhouse gases in the environment and result in the furtherance of better societal and economic growth (UNEP, 2018). The 2020 World Population and Housing Census Programme, recognizes population and housing censuses as one of the primary locations for inclusive socioeconomic development and environmental sustainability (UNSD, 2015).

Nevertheless, adequate waste management can have an alternative dual impact for the environment and the human economy (Vaccari et al., 2013). Aside from the obvious sanitary and environmentally friendly effect it can have on the physical surroundings, it

also aids in mitigating emissions that are toxic for climatic and atmospheric environments (Lim et al., 2014; Portugal-Pereira & Lee, 2016). Similarly, adequate waste management can provide an avenue to generate resources through waste recovery, upcycling, or recycling. This can also avoid the continuous exploitation of environmental endowments and reorient the dominant consumption and production pattern which often intensifies other social inequality issues (Diaz & Otoma, 2014). Thereby creating alternative economic patterns that are circular and contributed by sustainable waste management.

Solid waste solutions, which seemingly entail municipal collection, sorting, recycling, and secondary use of waste, are central to household activities at the source (UNEP, 2018). In order for a system to be sustainable, the inclusion of stakeholders, service users and service providers, is often recommended for such aspirations to be meaningfully attained (UN, 2015). Similarly, an inclusive perspective could potentially avoid household solid waste being dumped in the street, land, waterbodies, or mitigate open burning of waste. However, Massoud et al., (2021) said it is likely for established systems to fail in accounting for citizens' insight on proposed solid waste initiatives. Al-Khateeb et al., (2017) confirms that the attitudes toward waste separation at the source are significantly affected by contextual factors. Nevertheless, the volume of waste generated within the household significantly impacts per capita waste disposal. Hence, a holistic approach that involves households in solid waste management and the reorientation of waste as a resource is relevant for future economies (UNEP, 2015). The key role of households in waste generation and their systematic relevance for waste management, seems to also be restated in the issues of crisis and disaster management (UNEP, 2020). That is to say, safe household waste management is critical, especially in emergency situations like the COVID-19 outbreak (Nzeadibe & Ejike-Alieji, 2020; UNEP, 2020). It is important to recognise how municipal solid waste generated at homes during lockdown, quarantine, while caring for a sick family member, or during the recovery period has significant human and broader ecological consequences (WHO & UNICEF 2020). More ambitious, transformative, and integrated responses are urgently required to fully embrace the principles of inclusion in solid waste management to jointly achieve sustainability (United Nations, 2019).

1.2 Statement of Problem

Inadequate management of household solid waste in a densely populated city like Lagos can present challenges to societal development (Rahji & Oloruntoba, 2009). The absence of a well-managed and integrated channel for collecting, handling, and disposing of garbage can adversely affect society and its environs. A lack of proper recycling of solid waste from household units can significantly drive excessive consumption and production culture. Consumer habits of buying and trashing waste within the household often reinforce other pressing issues around capitalism. Furthermore, emissions rising from dumpsites within the state can significantly impact the current climate issues from the continent (Ife-Adediran, 2019).

Solid waste indiscriminately disposed of in our surroundings is often non-biodegradable and can clog community gutters and drainage systems. This can result in flooding, and a heavy downpour could wash these solid matters into bodies of water such as lakes, rivers, and the sea, thereby endangering aquatic life and biodiversity that can be found in the open ocean. This implies that open dumping and improper handling of household waste can often go a long way to affect societal health and access to potable drinking water (Coker et al., 2009). Waste travelling across the ocean can also emerge as wash-ups along the coast and into other countries. This surface waste can pollute the air, contaminate the land and even poison agricultural animals and farm produce. It is further exacerbating skewed socioeconomic challenges of class and power.

Ife-Adediran (2019) argued that government inefficiencies, such as the lack of law enforcement, are the leading cause of harmful waste management systems in most urban cities in Nigeria. According to Nzeadibe & Ejike-Alieji (2020), government policies concerning waste management need to be more inclusive of formal and informal primary stakeholders such as households and other casual waste workers. A well-regulated waste management system can also positively impact the unemployment rate by creating small businesses for entrepreneurs (Akinbola et al., 2015). In addition, entrepreneurship activities around recycling plastic waste can also create new businesses (Kehinde et al., 2020).

Unprecedented changes due to the ongoing COVID-19 pandemic seem to have heightened policy gaps in waste governance (Nzeadibe & Ejike-Alieji, 2020). The pandemic has impacted the increased production of household waste. New movement restrictions were

imposed by both the state and federal governments, and home office mandates from employers of labour. More families and residents are also now spending more time at home, and there is an increase in consumption at home. Development initiatives grounded in contextual reality can provide more sustainable solutions based on how people are, rather than how development experts believe they should be (Marsden, 1991). Bottom-up approaches that are participative and grow out of the local context are needed for successful development (Adams, 2009). At the same time, a place-based approach can strengthen local ownership and autonomy (which is a development goal in itself) and create solutions that reduce costs and respect local cultural practices (Ibid). Co-productive engagement in urban development can impact the range of alternative forms of state-society collaboration (Watson, 2014). It can therefore be beneficial to gain insight from a more bottom-up approach that seeks to involve households and improve waste management systems in Lagos state, Nigeria.

Everyday waste practices and systems should be used as a foundation for new waste projects (Gutberlet et al., 2017). Even though community perspectives on waste-related issues are vital, several issues still go beyond the community. Waste cannot be solved in isolation in each district but needs macro-structural interventions like governmental waste regulations, regulation for sustainable harvesting, changes in the production process and packaging, and international regulation on waste trade and waste compensation. However, these top-down approaches are yet to be richly informed and synchronised with the realities of key stakeholders such as households on the ground.

1.3 Research Objectives

This research intends to take a community-based approach by engaging with households and key stakeholders to explore various perspectives and everyday experiences around waste. This study proposes that active household engagement by existing waste management systems can benefit more sustainable waste management practices that society and other stakeholders can identify with an increased sense of ownership. This study is aimed at exploring coproduction in the management of solid waste with household communities in Lagos. The study also aims to contribute to knowledge and to fill the gap in research concerning the key role of households in solid waste management system in Lagos, Nigeria. The study seeks to make policy recommendations that can improve existing ideologies for conducting waste administration within the study area.

1.4 Research Questions

Main question:

What are the possibilities for coproduction in the management of solid waste with household communities in Lagos?

Sub-questions:

1. Why is the role of households relevant in SWMS?
2. How can the interactions in SWMS be improved to include households in waste services in Lagos?
3. How do the selected stakeholders in solid waste management system perceive avenues for a participative integration of households?

1.5 Study Area

This section presents an overview of Nigeria, describing the population of the people and how waste has been broadly addressed across the Federation. Furthermore, the geographic, socio-economic and waste management sector of Lagos is described and presented as the focus of the study.

1.5.1 Overview of Nigeria

Nigeria is one of Africa's most populous countries, with a population of over 200 million people and 250 ethnic groups (Ajayi & Udo, 2019). Each ethnic group inhabits a territory that it considers to be its own by right of first occupancy and inheritance. There are three major ethnic groups in the country: the Hausa-Fulani, the Yoruba, and the Igbo. Nigeria consists of 36 states and the Federal Capital Territory, where the country's capital, Abuja, is located. About half of the people live in rural areas and densely populated settlements occur along the coast in the west and the far north. Nigeria, like other developing countries, has birth and mortality rates that are higher than the world average. Since the mid-20th century, however, infant mortality has declined drastically, and life expectancy has increased; as a consequence, population growth has been rapid. A significant number of people have migrated to the more industrialised and urbanised states such as Lagos, Nigeria. (Udo & Falola, 2019)

Nigeria generates 43.2 million tonnes of waste annually, which is projected in 2025 to equal her crude oil production, which currently stands at approximately 89.63 million tonnes per year (GN, 2018). The Federal Ministry of Environment is responsible for environmental protection, natural resources conservation and sustainable development. In 2005, it developed a set of policy guidelines on solid waste management as well as defined the roles and responsibilities of Government at the Federal level, the State level and at Local Government level (IBR, 2014). Four solid waste management options are recommended within the policy guidelines: by Local Government/Municipal Agencies, Private Companies on contract with the LGA/Municipality, Private Companies on contract with Homeowners or by public-private partnership (PPP) (Ibid).

The National Environmental Standards and Regulations Enforcement Agency (NESREA), established in 2007 (and replacing the Federal Environmental Protection Agency), is the body charged with the enforcement of environmental laws, standards and regulations in the country including solid waste management (IBR, 2014). The National Environmental (Sanitation and Wastes Control) Regulations of 2009 further provides the legal framework for environmental sanitation and waste management in Nigeria (IBR, 2014).

1.5.2 Lagos State, Nigeria

Lagos state, a cosmopolitan city consisting of islands and mainland areas, is the former capital of and the largest urban region in Nigeria. It was also the capital of Nigeria until 1991, when Abuja took over as the federal capital territory (Population Stat, 2022). Lagos is one of Africa's largest cities, with Ikeja as the capital. It has a population of over 15 million people (World Population Review, 2021). The State is located in the South–Western part of Nigeria, and the smallest state in the country yet, it has the highest urban population, which is 27.4 percent of the national estimate (Lagos State Government, 2022). It is also the 8th fastest growing city in Africa (World Population Review, 2021). The city of Lagos covers an immense area, coming in with a total of 1,171.28 square kilometres. The density is around 6,871 residents per square kilometre (World Population Review, 2021). It consists of five Local Government Councils, vis: Lagos Island, Lagos Mainland, Surulere, Apapa, and Eti-Osa, as well as eight Local council development areas which include: Lagos Island East, Yaba, Itire-Ikate, Coker-Aguda, Ikoyi-Obalende, Apapa-Iganmu, Eti-Osa East and Iru/Victoria Island with the City of Lagos being the pivot of an ever-expanding megacity (Lagos State Government, 2022). By 2050, Lagos'

population is expected to double once more, which will make it the 3rd largest city in the world but with less infrastructure than any other large cities in the world (World Population Review, 2021).

1.5.3 Geographical Description

Lying approximately on longitude 20 42'E and 32 2'E respectively, and between latitude 60 22'N and 60 2'N. Lagos State is bounded in the North and East by Ogun State of Nigeria, in the West by Republic of Benin, and stretches over 180 kilometres along the Guinea Coast of the Bight of Benin on the Atlantic Ocean (World Population Review, 2021). The topography of Lagos is made up of systems of sandbars, islands, lagoons and encompasses what used to be four islands: Victoria Island, Lagos, Iddo, and Ikoyi (Britannica, 2019). The metropolitan area originated on islands, including Lagos Island, that were separated from the Atlantic Ocean by sand spits, and has since spread to the mainland west of the lagoon (World Population Review, 2021). Land reclamation over the years has meant that some of the former islands are no longer true islands and are connected to the mainland area (Population Stat, 2022). The dominant vegetation of the State is the freshwater and mangrove swamp forests, both of which are influenced by the double rainfall pattern of the state, which makes the environment a wetland region. Generally, the State has two climatic seasons: Dry (November-March) and wet (April-October). The major water bodies are the Lagos and Lekki Lagoons, Yewa, Ogun, Oshun, and Kweme Rivers. Others are Ologe Lagoon, Kuramo Waters, and Badagry, Five Cowries and Omu Creeks respectively (Lagos State Government, 2022). Of Nigeria's over 700 km Atlantic sandy beaches, the State has the majority with its 180 km coconut-fringed Atlantic littoral which consists of several beaches rising to about 20 between Badagry in the west and Lekki in the east (Lagos State Government, 2022). The drainage system of the State is characterised by a maze of lagoons and waterways, which constitutes about 22% or 75.755 hectares of the State's territory (Lagos State Government, 2022).

1.5.4 Socio-economic Context

Lagos was originally inhabited by the Awori group of the Yoruba people who are identifiably the dominant ethnic group in the city today (World Population Review, 2021). Many people from other parts of Nigeria and neighbouring countries have made Lagos State their home, making it an attractive destination for tourists (Lagos State Government,

2022). It is a port city and about 250 ethnic groups in Nigeria are represented in Lagos, including the Hausa, Igbo, and Fulani. Small minorities of American, British, East Indian, Chinese, white Zimbabwean, Greek, Syrian, Lebanese and Japanese are also present in the city (World Population Review, 2021). It is also home to the Nigerian Stock Exchange and accounts for over 80% of the country's foreign trade flows and generates over 50% of Nigeria's port revenues (Lagos State Government, 2022). Lagos state's agricultural and fishing output includes cassava (manioc), palm oil and kernels, coconuts, corn (maize), vegetables, fruits, and fish. These products are collected in the lagoon ports of Badagry, Epe, and Ikorodu and shipped to markets in Lagos city (Britannica, 2019). Lagos State plays a pivotal role in the Nigerian economy and as a nation's commercial nerve centre, remains the focal point of economic activities (Lagos State Government, 2022). The city now generates 25% of Nigeria's total gross domestic product, and it has many millionaires (World Population Review, 2021). However, Lagos has more than 100 slums and informal settlements, and more than 60 percent of its residents live in deprivation (Lawanson, 2020). As a result, the majority of residents are in dire need of water, sanitation, or other basic services, which increases their vulnerability during a health crisis.

1.5.6 Regulated Waste Management Sector

The Lagos Waste Management Authority (LAWMA), formerly known as Lagos State Refuse Disposal Board (LSRDB) at inception, was established in 1977 (LAWMA, 2021). LSRDB was established to enable the state to cope with sanitation and the volume of waste resulting from the oil-boom stimulated economy. Migrants from Nigeria's rural and less developed areas, as well as from neighbouring countries, also influenced the establishment of the LSRDB (LAWMA, 2021). LSRDB was renamed Lagos Waste Management Authority in March 2007. By provision of the Environmental Management & Protection Law of 1st March, 2017, the Authority is re-positioned from an Operator/Regulator into a full Regulator in the Waste Management Sector, in line with the Cleaner Lagos initiative. By this arrangement, public waste operations, domestic waste operations, waste management operations, landfill operations, and transfer loading stations have been concessioned to private sector participants (PSP), while LAWMA will guide, model, and appraise these practitioners in line with international best practices (LAWMA, 2021).

Lagos State generates over 14,000 metric tonnes (about 490 trailer loads) of refuse per day (VN, 2021). The quantity of refuse generated in the state exceeds the Lagos Waste

Management Authority (LAWMA) daily evacuation, hence waste is still being dumped in other illegal dumpsites across the state. An estimated 70 percent of the waste in the state goes to approved dump sites, while the remaining 30 percent remains unaccounted for and is disposed of illegally (GN, 2018). While the state government, through the Lagos State Environmental (Sanitation and Waste Control) Regulations 2014, stipulated guidelines for waste collection and disposal in the state, it contends with the growing challenge of managing municipal solid waste emanating from the state.

1.6 Organisation of Study

The current chapter one has introduced the background for this report. Presenting solid waste management and its association with sustainability in social, economic, environmental and human development. Further description of the problem statement is followed by the objectives and the key questions for this research, prior to an exploration of the study area.

Chapter Two reviews existing literature with an established argument for integrated solid waste management systems and identifying gaps for participatory waste governance. Peer reviewed articles buttressed the need for households in solid waste management and raised the discussion for household participation. The household and digital innovations in solid waste management were examined within the development context, and the chapter finally presented the theoretical framework for this report.

The research methodology is the core focus in chapter three, and it presents an initial reflexivity that is followed by the research strategy, where a qualitative case study, epistemology, and ontological perspectives are discussed. To ensure that the research questions are answered, relevant sampling techniques are considered alongside evaluation criteria within the study. The chapter narrates how participants were recruited and later outlines relevant COVID-19 preparedness plans. The data collection entails discussions on semi-structured telephone interviews and the literature review process. It also presents a brief discussion of the analysis technique. The essential details of how permissions were obtained and how the ensuing data was processed were also presented. The chapter finally narrates an ethical self-assessment that guided the overall conduct of the study.

Chapter four applies the conceptual lens in presenting the findings from digital fieldwork conducted in the study area. The data is broadly presented in three sections, and the reports

from the participants are outlined as sub themes within each corresponding section. The views, concerns, and debates contained within the data were deduced from the interviews with households, private sector operators, and LAWMA officers.

In chapter five, the findings were analytically and conceptually explored to ascertain if the research questions had been answered. Further analytical discussions of the research findings were elaborated upon with relevant inputs from existing research. The chapter entails an expanded viewpoint of how initial findings interact within the context of the study as well as its significance to broader society.

Chapter six concludes by summarising the key findings and discussion of the study. It entails study limitations, recommendations for future studies, and considerations for policymakers that seek to explore avenues for integrating household communities in SWMS.

CHAPTER TWO: LITERATURE REVIEW

This chapter will draw from relevant literary insights and ideas to lay the groundwork for the contribution that this study seeks to make. The following sections focus on Integrated solid waste management systems, participatory waste governance, households in solid waste management, household participation in solid waste management, households and digital innovations in solid waste management, and finally present the theoretical framework for this report.

2.1 Integrated Solid Waste Management Systems (ISWMS)

Many academic papers acknowledge the limitations of solid waste management systems (SWMS) in developing countries to design resilient systems and strategies to address the myriad concerns associated with improper waste disposal. In most emerging economies, rapidly increasing populations, changing production and consumption patterns, fast urbanisation, and poor disposal capacity, among many other challenges, have contributed to increased solid waste, further overburdening the solid waste system (Marshall & Farahbakhsh, 2013; Raghu & Rodrigues, 2020; Rathore & Sarmah, 2020; Vitorino de Souza Melaré et al., 2017; Wilson et al., 2013). In addition, the waste management system in developing countries, particularly at the municipal level, is further burdened by inefficient waste collection and illegal dumping, the absence of a legal framework, and the presence of many informal actors, with weak government capacity to plan and coordinate the waste management system (Ezebilo, 2013; Guerrero et al., 2013; Sundaravadivel & Vigneswaran, 2003; Turcott Cervantes et al., 2018).

Although various system models and analysis/assessment tools are available for monitoring and optimising SWMSs, some academic papers identify that these models focus primarily on the economic and environmental spheres of SWM with limited attention to the social aspects (Seadon, 2010; Vasconcelos et al., 2021). In addition, given the amount of waste generated globally is projected to increase significantly, some academic literature suggests an integrative approach to managing the complexities associated with waste management and its association with countries' environmental, economic, and social pillars (Ikhlayel, 2018; Shekdar, 2009). As Marshall & Farahbakhsh (2013) suggest, most SWMS studies have highlighted the need for a holistic and integrated approach that

accommodates the interconnectedness of waste management's socio-cultural, environmental, and technical spheres.

According to Lawrence et al., (2020), an integrated solid waste management (ISWM) system entails a sustainability model that categorises various forms of resource recovery (creating new outputs with waste). The circular economy viewpoint applies to the resource, recovery and reuse system that retains a flow of resources while enhancing the economy (Rathore & Sarmah, 2020). Fernando, (2019) defines ISWM as "a comprehensive approach that includes waste prevention, recycling, composting, and disposal and effectively manages solid waste in ways that preserve human health and the environment". Although resource recovery, as argued in ISWM, is considered one of the most significant aspects of waste management in linear production and consumption systems. Yet, in developing countries where the informal sector has played a crucial role in resource recovery, such as recycling, socio-political barriers have excluded these informal actors from existing waste management systems (Singh & Ordoñez, 2016; Aparcana, 2017). Therefore, some academic researchers, such as (Bulkeley & Gregson, 2009; Ebekozien et al., 2022), advocate for the ISWM approach that aims to include various aspects of society and reflect the environmental, economic, social, and institutional factors to motivate a sense of active participation across different segments of society.

Empirical studies in emerging economies contexts that focus on the concepts of ISWMSs argue for the effectiveness of integrated systems in the recovery of nutrients, materials, and energy from waste streams and the overall reduction in greenhouse gas emissions compared to the conventional landfill disposal approach (Ikhlayel, 2018; Menikpura et al., 2013; Weng & Fujiwara). However, some of these empirical studies identify the need for the sustainability of waste management systems to be defined at the local level to address the most pressing challenges in a given context. This approach is argued to involve the crucial stakeholders at the local level, including the private sector, local communities and households and guarantees integration beyond the technical systems (Marshall & Farahbakhsh, 2013; Menikpura et al., 2013; Wilson et al., 2015). As Zurbrügg et al., (2012) suggest, the ISWMS is a complete approach to waste management that complements the strictly technological process and incorporates stakeholders, social, financial, legislative and institutional dimensions.

A holistic, ISWM strategy identifies the state's administrative influence and citizens' active participation as vital for innovating new systems to waste management (Zotos et al., 2009). Furthermore, as Zotos et al., (2009) pointed out, there is a need for cooperation and the integration of models to minimise the segmentation of the waste management system and guarantee a holistic approach to ISWM. Zorpas, (2020) also mentions the need for a holistic strategy in the waste management framework as a possible means to inspire better waste practices and achieve climate neutrality by 2050. In addition, local stakeholders can tailor citizen engagement and awareness efforts to meet the reality of their communities if they are active in ISWM (Zorpas, 2020).

The study conducted by Gutberlet, (2015) described an in-depth experience in the co-creation of knowledge to facilitate the cases of selective waste collection, which can provide the possibility for unique opportunities. The author's findings note that public awareness is critical to achieving a better and more sustainable way of dealing with consumption and waste. However, Ma & Hipel (2016) applied a preliminary and exploratory systematic literature review methodology to other studies conducted between 1980 to 2014 on the social aspects of municipal solid waste (MSW) management in terms of vulnerability, the participation of the public, their attitude and behaviour as well as public policies. Ma & Hipel, (2016) analysis indicated that the global distribution of social dimension reports on MSWM is inequitable, and the research on the social aspect is insufficient.

Several articles tend to focus on the technological or economic perspective on waste management systems for sustainability. This view highlights critical aspects of advanced innovation suited to more advanced systems (Kollikkathara et al., 2009; Pires et al., 2011; Rathore & Sarmah, 2020). However, the social dimension of resolving waste management issues that sometimes demand time to set up can have far more beneficial externalities for developing societies and their environment. Communities are mostly socially formulated in a nonhomogeneous way, and approaches that focus on influencing societal norms and lifestyles have a long-term impact on these communities. To co-create new ways to deal with waste that can engage the public and other actors in the state to become more aware of taking responsibility for building sustainable systems (Ma & Hipel, 2016). A key argument of Ma & Hipel, (2016) is that a MSWM system's success depends on technical innovation and is also significantly influenced by social, economic, and

psychological factors, such as public participation, policy, and public attitude and behaviour.

2.2 Participatory Waste Governance

Most academic literature highlights the waste management challenges in low and middle-income countries (de Feo & de Gisi, 2010; Sholanke & Gutberlet, 2022; van Welie & Romijn, 2018). Academic studies advocate for social and environmental fairness in a more holistic solid waste management approach (Kubanza & Simatele, 2016). As Sholanke & Gutberlet, (2022) point out, waste's problematic nature has triggered the devolution of waste management from central governments to provincial, municipalities, agencies, and other commercial entities. The dire consequences of ineffective waste management and its significant influence on health, the economy, and the local and global environment buttress the need to view waste governance above the prescriptive engineering approach to the emerging transdisciplinary and cross-sectoral approach (Buch et al., 2021; Kubanza & Simatele, 2016; Lougheed et al., 2018). As Kubanza & Simatele, (2016) argued, governing waste requires the coordination of many structures, institutions, policies, and actors and requires a democratic approach that focuses on the issues of power, scale, and equality.

Some perspectives on ISWMSs suggest waste materials and treatment technologies, market orientation, and tailoring to unique community requirements by incorporating stakeholder viewpoints (Serge Kubanza, 2021; Sholanke & Gutberlet, 2022; Wadehra & Mishra, 2018). Sholanke & Gutberlet, (2022) define this participatory approach to ISWM governance as an inclusive and collaborative form of government that actively involves non-state actors in service delivery and decision-making. However, several constraints impede achieving harmonisation in service delivery and waste management decision-making. On the one hand, Marshall & Farahbakhsh, (2013) identify the numerous conflicting interests that could hamper participation. In addition, many developing countries lack the institutions and structures to foster effective involvement in solid waste management. On the other hand, beyond weak regulation, technical, institutional, and cultural barriers hinder non-state actors' participation in the integrated deliberative process crucial in participatory governance (Ezeudu et al., 2021; Petts, 2004). Nonetheless, collaborative governance models for waste management as viable and a proactive approach to addressing the complexity of ISWM (Ezeudu et al., 2021; Sorrentino et al., 2018).

While many emphases have been placed on the need for advances in waste governance policies, coordination, and collaboration among stakeholders across various sectors, a comprehensive view of stakeholders in solid waste management appears to be lacking (van Leeuwen et al., 2018; Vanhuyse et al., 2021). Existing arguments for a collaborative waste governance model are often channelled towards the informal sector of waste pickers, scavengers, and non-state actors and are overly focused on recycling activities. There appears to be minimal literature on households as crucial stakeholders in sustainable integrated waste management (Sholanke & Gutberlet, 2022). For this research, a household is defined as a social unit of people that live in the same house and is characterised by its members and their qualities (Boulet et al., 2021; Reid et al., 2010).

Most of the literature on households' involvement in solid waste management focuses on a consumption perspective and typically focuses on awareness-raising and communication of policies to influence participation as opposed to being an integral part of the deliberative process (Wadehra & Mishra, 2018; Zhang et al., 2022). Therefore, most studies on households' involvement in ISWM focus on the attitudes and practices of households rather than the active participation of households as stakeholders in waste management (Fadhullah et al., 2022; Padilla & Trujillo, 2018; Laor et al., 2018).

However, as Raven et al., (2021) pointed out, households are usually considered important as a target for government policies and considered crucial as they need to align with behaviour change policies to reduce waste. Raven et al., (2021) argue that while policies are directed toward individuals, households beyond users form a meaningful social context that determines if these policies succeed or fail. Although households are a significant source of waste production, pollution and lock-in into high carbon lifestyles, recent academic literature argues that they can also be a source of independent innovation and drive social innovations as individuals or a community (Raven et al., 2021; Trischler et al., 2022). Examples of households' direct involvement and participation in solid waste management include informal recycling, composting, and upcycling (Kumar et al., 2018; Sung et al., 2019)

2.3 Households In Solid Waste Management

According to Reid et al., (2010), households should be regarded as a societal unit and critical site for pro-environmental engagement at the meso level that mediates between the

macro scale (government and policy development) and the micro-level (individuals). Therefore, a unique viewpoint of environmental behaviour, engagement, and interactions can be gained from households, which can be used to create changes in action, behaviour and practices and govern sustainable solid waste (Kaplan Mintz et al., 2019; Raven et al., 2021). Some academic literature has recently adopted this approach and undertaken empirical research to understand household waste management practices and behaviours. However, some evidence suggests that factors that shape household behaviours in waste management are usually location or context-specific, making generalisations of such findings challenging (Alhassan et al., 2018).

However, some general socio-economic and situational factors have been identified as critical to household waste management practices and behaviours. For instance, researchers have identified socio-economic factors such as education level and household income as crucial to the willingness to pay for solid waste disposal services (Ejigie, 2008; Gahana Gopal et al., 2018; Russel et al., 2015). Situational factors such as the availability of bins (particularly for sorting) and waste collection frequency could also affect households' waste disposal behavior and practice (Shen et al., 2019; Tonglet et al., 2004). Other factors such as public trust, public knowledge, publicity, and public education have been identified as crucial to influencing public awareness and practice regarding solid waste disposal and management (de Feo & de Gisi, 2010; Laor et al., 2018; Ma & Hipel, 2016).

While the arguments for policies to begin to incorporate approaches to engage households in active waste management and participation in sustainable practices are crucial, there is a need for a broader policy discourse that integrates individuals and households to improve public service delivery (Loeffler & Bovaird, 2016; Meng et al., 2019; Padilla & Trujillo, 2018; Sarbassov et al., 2019). Exploring the adoption of coproduction in ISWMSs and governance holds excellent prospects in this regard. Individuals, households, and communities' coproduction is a public policy implementation strategy that places the responsibility of achieving sustainability in solid waste management directly on citizens who act without coercion to achieve policy goals (Raven et al., 2021; Steen et al., 2016). This study builds on the work of other authors to explore the social dimension of waste management and focuses on including the household through coproduction. The complexity of solid waste management issues cuts across key aspects of society (Gutberlet et al., 2017). Therefore, alternative approaches to waste management can

also be explored by actively engaging with the realities of those who are the end-users within a system.

2.4 Household Participation in Solid Waste Management

While ISWM combines different techniques and expertise such as technical, managerial, legal, and financial aspects to combat SWM problems, household participation is arguably crucial to achieving sustainable ISWM (Noufal et al., 2021). Numerous studies have identified public engagement, environmental education, informed discussions, and public awareness as paramount to improving solid waste management (Brown & McGranahan, 2016; Everard et al., 2016; Wang et al., 2020). For instance, Choon et al., (2017) conducted a survey in Malaysia on public knowledge of household solid waste recycling. They discovered that the amount of awareness and comprehension of recycling significantly impacts participation. Sarbassov et al., (2019) bolster the need for awareness and education to foster household participation in solid waste management. Sarbassov et al.'s (2019) research points out that households are willing to participate in solid waste management. However, public awareness efforts are vital to ensure household participation.

In Nigeria, the context of interest for this research, Adekola et al., (2021) find that the low level of awareness serves as a massive contributor to the participation of households in solid waste management. In addition, Dawodu et al.'s (2021) study also suggests that the authority's effort to raise awareness is dismal, contributing to indiscriminate waste disposal. Also, Serge Kubanza et al., (2022) advocate for SWM education and awareness as a necessary pathway to achieving success in SWM. Furthermore, several other studies buttress the gap in information about safe handling of waste, general waste management and a negative attitude to maintaining a sanitary environment as evident barriers to SWM and improving public awareness as a dire need (Antwi-Agyei et al., 2020; Bui et al., 2020; Gahana Gopal et al., 2018; Simiyu et al., 2020).

However, household participation goes beyond waste management education and awareness-raising from the literature reviewed. Finance plays a crucial role in solid waste management, from safe waste disposal to recycling (Sotamenou et al., 2019; Tsai et al., 2020). Several studies have identified factors such as level of education, marital status, occupation, and region of residence as factors that influence households' willingness to pay for improved SWM services (Almazán-Casali et al., 2019; Ezebilo, 2013; Rahji &

Oloruntoba, 2009). However, participation and socialisation in ISWM hold the potential to harness stakeholders' resources for the long-term improvement of SWM (Tsai et al., 2020). As Rahji & Oloruntoba, (2009) posit, societal willingness-to-pay for SWM is positively correlated with their level of knowledge, hence an active environmental campaign in society is necessary. Nepal et al., (2022) found in a study conducted in Nepal that although households were dissatisfied with the existing waste collection practice, community members' participation in designing the timing and frequency of waste collection was identified as significant for the improvement of household SWM.

Although involving stakeholders such as households in decision making is a fundamental part of attaining sustainable SWM and tackling solid waste challenges, the process of participation and engagement bears its challenges (Petts, 2004). Stakeholders' multiple perspectives and contrasting views may result in conflicts without a proper plan to facilitate communication and stakeholders' involvement (Vučijak et al., 2016). Nevertheless, Tsai et al., (2020) point out that stakeholder involvement could improve user retention and capture in solid waste management and boost the profitability of solid waste management services.

2.5 Households and Digital Innovations In Solid Waste Management

Due to the weak technological infrastructure, the lack of digital access, many developing countries have limited ICT-based solutions to address the burden of fragmented solid waste collection and management (Zhou et al., 2021). Nonetheless, digital technologies still find little use in developing countries. A growing approach in low and middle-income countries is using digital tools to coordinate waste collection from households using seemingly smart applications that link these households to waste collectors and recyclers (Spuhler et al., 2020; Vitorino de Souza Melaré et al., 2017). Digital platforms can also be used for awareness-raising on waste management and recycling, providing tailored information to households and providing opportunities for communication using social media platforms (Miner et al., 2020; Padilla & Trujillo, 2018). Similarly, awareness can be addressed in this form to both public and institutional structures. Xu & Tang (2020) in their study affirmed that minorities are more likely than the general population to use smart technology to request critical government services, as they may have higher demands but less political capital.

2.6 Theoretical Framework

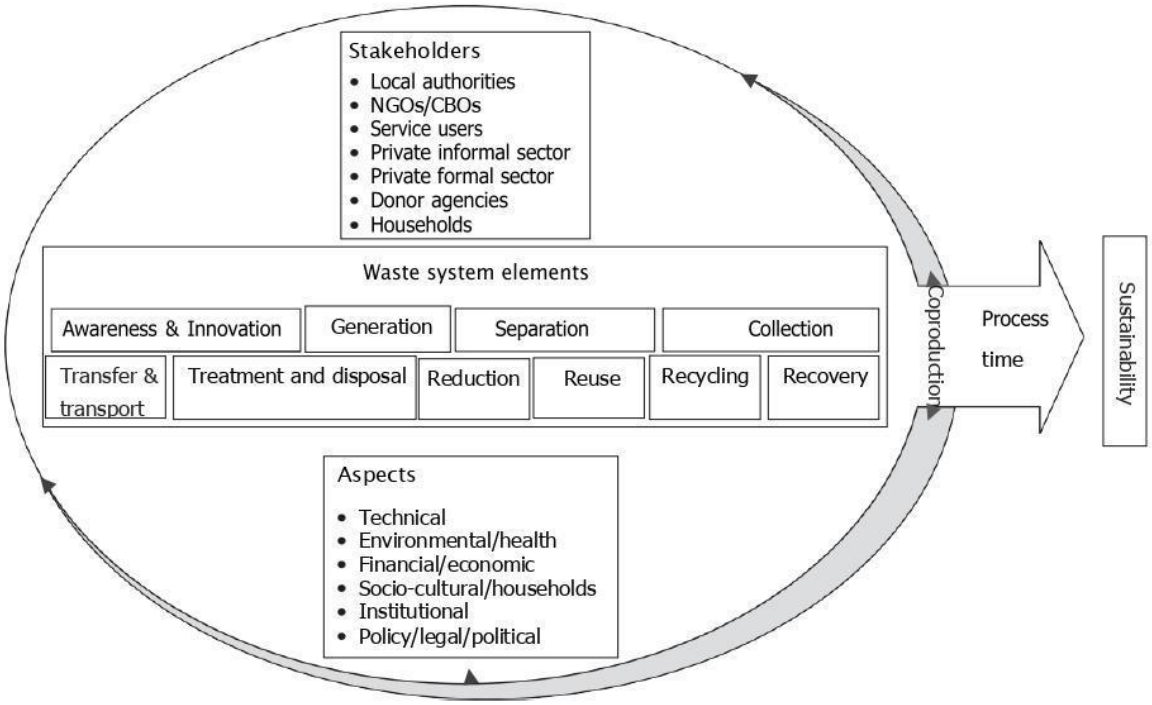

Figure 1: Integrated Sustainable Waste Management (ISWM) adapted from Wilson et al., (2013).

Van De Klundert & Anschütz, (2001) initially contributed to the formulation of the Integrated Sustainable Waste Management (ISWM) in Ittingen, Switzerland. This was to help develop an approach based on experience that can address common waste management issues in low and middle-income countries. Similarly, the ISWM framework for the current study has been adopted from Wilson et al., (2013), as published in the proceedings of the institution of civil engineers -waste and resource management. This illustrates the cross disciplinary nature of waste management issues and the relevance of multiple actors in attempting to resolve them.

Wilson et al., (2013), mentioned that the initial framework highlights core areas for ISWM to be achieved in three dimensions, such as the stakeholders, waste system elements and in the dimension of its aspects. The aspects include the technical, environmental/health, financial/economic, socio-cultural, institutional, and policy/legal/political. Which can be likened to show the Political, Economic, Social, Technological, Legal and Environmental factors, henceforth referred within this study as PESTEL (Boddy, 2017). The various aspects also require process time to achieve the intended aim of sustainability. Therefore, the relevant dimensions of the initial framework have been described and the purpose for which it has been adapted within this study will be further discussed.

Consequently, it was noted that the initial framework appeared simplistic (Wilson et al., 2013), for sustainability goals to be adequately achieved within the context it was originally designed to work. Hence, the theoretical diagram has not been merely replicated above, however, it has provided an avenue to build upon and contribute to an already existing knowledge on integrated sustainable waste management systems. Again, the main argument for this thesis is represented within the previous framework where the role of households seemed to have been omitted. This research has modified the above framework based on the current literature review to suit the study area of Lagos, Nigeria.

The theoretical framework has been adapted to include the essential role of households in the socio-cultural aspect of the PESTEL (Boddy, 2017). This is as the household can be easily identified as a socio-cultural unit where individual interests interact at the meso-level (Reid et al., 2010). Additionally, awareness and innovation have been added as key elements that can help drive the mission for resource recovery in solid waste management and enable a more circular system. Awareness and innovation are also important elements for coproduction, as they can help to achieve adequate inclusion among current stakeholders. Nevertheless, the framework has also been modified to indicate the key role of households alongside the previously existing stakeholders. Finally, coproduction is presented as a binding connection through which process and time are needed while aiming for sustainability. Coproduction is also a major concept adopted in the current study and the following section will present it in more detail.

2.6.1 Coproduction

This research will adopt the lens of coproduction by Ostrom (1996), to explore the various sections of this report. According to Ostrom, (1996), coproduction is a method of transforming inputs from people who are not members of the same organisation into goods and services. Ostrom, (1996) usage of the term “coproduction” implies that citizens can actively participate in creating public goods and services that are important to them. To say that citizens can participate in creating important public goods and services such as solid waste management in the current study, is to use the term "coproduction" (Ostrom, 1996). Several other studies, including the conceptual author assert that synergy between government actions and citizen actions can be achieved through coproduction (Bovaird, 2007; Ostrom, 1996). Wiewiora et al., (2016), describes efficient service delivery as a combination of asset functionality and human technical capacity, implying that external stakeholder participation is crucial. Stakeholders can also be those who may or may not

directly benefit from a service. Therefore, it is critical for service providers to interact with various individuals who use their services, as the community as a whole can have a substantial impact on the quality of service delivery (Uzochukwu & Thomas, 2018; van den Broek, 2019). As defined by Whitaker (1980), service delivery is a process in which an agent facilitates change, rather than providing a "finished product" to the citizen, both the agent and citizen work together to bring about the intended transformation. While addressing conceptualization of coproduction and its relationship to the co-creation of public value, Osborne et al., (2016) highlights coproduction as the voluntary or involuntary involvement of public service users in any of the design, management, delivery and/or evaluation of public services. Thereby moving beyond consultation which is often pre-prescribed solutions to an alternative in-depth and systematic engagement of citizens and users of services.

While authors like Nabatchi et al., (2017) has criticised the umbrella usage of the concept, issues in coproduction have also been discussed on matters of social exclusion, fragmentation of public service or avenue for fraud (Cepiku & Giordano, 2014; Whitaker, 1980). Their contribution resolves that coproduction in practice can be further developed and contextualised to achieve the intended goal of public good. Vollan & Ostrom (2010) in their study titled cooperation and the commons, explored local communities' engagement with their relationship to nature. The authors also acknowledged the contribution from previous studies to demonstrate that, while community dwellers were thought to constantly value self-interest, this was not always the case. Vollan & Ostrom, (2010) argued that certain environmental factors can enable a more collaborative approach. Governance and market access were mentioned as influential elements on community behaviour (Vollan & Ostrom, 2010). The study draws illustrations from aspects of the natural environment that can be easily understood as self-existent, and the current study looks at other aspects of the environment created by human interactions for a similar form of collaboration that can benefit the environment. A combination of self-governing communities and institutions could be the key to successful development. The ideas of coproduction seem to be essentially resourceful for resolving complexities around waste management which can be experienced through unique realities (Ostrom, 1996). Societal members are aware of their shared problems, and they can be resourceful in coming up with creative solutions to these problems. The issue of solid waste in the communities of Lagos can be raised by diverse interest groups as seen in the theoretical framework and expressed in various ways. Coproduction provides a democratic avenue to engage with multiple views and ideas about

a similar topic. The combination of diverse opinions that can be involved in the process of planning is a core feature for adopting this concept. The research questions reflected in this study are formulated around how societal groups, experience and engage each other to achieve a result. Coproduction can provide a view to understanding the activity of each group by themselves and how they relate across the elements and aspects of the theoretical framework. The study will therefore rely on the concept of coproduction to frame and analyse the data that will subsequently emerge in this report.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The objective of this study is to explore the possibilities for coproduction in the management of solid waste with household communities in Lagos. This study proposes that an active household engagement by existing waste management systems is essential for a more sustainable waste management practices that society and other stakeholders can identify with an increased sense of ownership.

In this chapter, I will present and discuss key ideas that guided how data was sorted, collected, managed, and used for the purpose of the research. The main heading within this chapter includes reflexivity, research strategy, sampling techniques, evaluation criteria, participant recruitment, data collection, analysis technique, permissions, data processing and ethical discussions.

3.2 Reflexivity

According to O'reilly (2011), social researchers are part of the world they investigate, and reflexivity implies being aware of how our background, personality or experiences usually interact with how meaning is often interpreted and allocated. While thinking about a topical issue for this research, an incident that happened within my neighbourhood in Nigeria sparked my interest. Covid-19 pandemic had just started and the measures that followed exacerbated several existing challenges. The difficulties experienced concerning solid waste management within the state, had also become a seemingly precarious issue, collapsing around some household communities.

In the Lagos housing community where I lived, it was conventional for tenants to pool their resources to pay for waste evacuation by state-approved waste disposal companies. The garbage truck usually comes once a week to pick up trash from the communal bin provided by the tenants in my compound. The majority of the neighbourhood's collective bins are typically open without lids. As a result, it was not unusual to see waste bins overflowing prior to the routine evacuation. I often considered the immediate pollution caused by such an eyesore, the vectors it attracts, and the possibility of more adequate bins to contain the mess. This was not a one-off problem for one household; it was a common occurrence in neighbouring homes where both elderly and

young children lived with their parents. This makes me wonder about the health implications of open waste on both my own and my neighbours' daily lives. Under normal circumstances, each household is expected to properly tie up their waste in a trash bag before disposing of it in the designated bin. However, this is not always the case because most tenants dispose of their waste directly into the bin, while others may not care whether or not the trash bag is closed. Waste also litters the streets because open bins are sometimes placed outside gated compounds. This makes it easier for uncovered trash to attract pests and rodents to the neighbourhood. Such conduct also calls into question the level of awareness for how proper waste management should be carried out within the household.

The waste that is discarded in the household is usually mixed up and includes solid waste materials such as paper, metal, glass, plastic bags, and bottles. The majority of these items could have been salvaged or recycled for a more purposeful reuse. Another thing that struck me was how the contents of the waste bin were never an issue for disposal companies. Instead, the emphasis is on how quickly disposal dues can be paid. Even if the household coordinates their solid waste in communal containers, it does not mask the odour that can offensively pollute the neighbourhood. During weekly evacuation, the compositional odour of already decomposing waste is frequently re-experienced. The unsanitary state of garbage trucks, on the other hand, circulates the smell as they drive around. This also made me wonder how well-maintained the disposal trucks are in order to operate within residential dwellings. While waste management issues in my neighbourhood continue to escalate, residents appear to be at the mercy of waste disposal companies. When the disposal companies were unable to respond within a week, I observed that there was no other option for such situations to be adequately managed. The obvious demand within the state continues to be that households subscribe to private waste companies and put out garbage for waste evacuation.

However, Lagos is surrounded by water bodies ranging from small lagoons to a shared border with the Atlantic Ocean. The state also serves as a haven for rich ecological swamps and the biodiversity that thrives on wetlands. I've often wondered how a lack of proper solid waste management endangers marine life and other important organisms in the environment. It is common for solid waste generated in household communities to end up in gutters, contributing to the state's flooding crisis. As these floods dry and flow out through available channels and lagoons, they tend to collect a significant amount of solid waste, which is then returned to nature. Solid waste, such as glass, metal, and even plastics

that are not biodegradable, then appears to flow from households to the ocean, having an unprecedented impact on the future. Yet, the issue of garbage disposal and material recovery can benefit from more active waste disposal collaboration.

Finally, when Nigeria's Covid-19 movement restrictions laws were passed, more people were forced to stay indoors, while others were able to work from home. Most households' consumption and waste production increased as a result. Waste disposal companies in my neighbourhood were understandably unable to initiate evacuation. A novel pandemic has halted waste disposal business as usual, and it appears that households may also need to navigate a solid waste disaster. Hips of garbage continued to pile up and pollute the environment as household consumption increased and there were no substitutes for waste management. Households in my neighbourhood appeared to be burdened by waste accumulation and to be victims of the waste they produced. This made me wonder what the state's role is in all of these interconnected issues. Where does the efficiency of waste management participants in the private sector lie? How can households be empowered to collaborate on garbage disposal and waste material recovery? What effect does waste have on our daily lives? And what hope is there for the environment, let alone future generations? Hence the idea for the study emerged and evolved to explore avenues for collaborative waste management.

Through the entire process of the research, I have reflected on my background as a Nigerian who is knowledgeable about the context under investigation and its influence on the choice of topic, location and meaning within the study. Being able to reflect about personal bias can enable the researcher to be more open to new information that can contradict individual assumptions and ensure that the researcher is not the focus of the study (O'reilly 2011). Nevertheless, covid-19 movement restrictions for precautionary and mandatory reasons also provided an avenue to physically detach from being submerged into familiar bias. I also reflected on my previous engagement with the waste management system as a household member. Therefore, other groups of experts and operators involved in waste management duties also participated in the research, which provided clarity and limited the interference of personal bias. The availability of contextual knowledge also aided a smooth flow during conversations with interviewees. The choice of language and words were to a large extent, less ambiguous to grasp and participant use of local slang enriched the chats with mutual understanding.

Furthermore I was able to reflect on the data both when I adjusted the questions being asked and while transcribing for each participant group. The interview transcripts were fully anonymized and coded into first impression themes that emerged in the preliminary report. The meaning within the various themes was reviewed and processed to deduce broader interpretations as the study findings. The findings from the data gathered then directed the furtherance of the literature review. The various themes that resulted from coding the transcribed data have been presented to reflect direct quotes from the participants so the data can speak for itself.

3.3 Research Strategy

According to Bryman (2016), social research can emerge from individual reflections on literary gaps or real-life issues observed within societal contexts. Such reflections have been discussed in the previous section. Therefore, social research does not often exist in isolation of the researcher's ideologies or perceptions about the study being conducted. That is to say, it is common for researchers to adopt a strategy through which they observe and understand the phenomena that exist around them (Bryman 2016). This can influence how knowledge is often derived or how social realities are constructed within the current study. Therefore, I will discuss the qualitative nature of this research, the study design, epistemological consideration, inductive and deductive approaches, as well as the ontological perspectives that define the current research strategy.

3.3.1 Qualitative Case Study and Epistemological Discussions

A qualitative study can be seen as an approach that emphasises the use of words to gain in-depth understanding about perception or experiences as well as how such information is collected and analysed (Bryman 2016, p.375). I have done a qualitative study in which a case study design was adopted to explore Lagos as the study area and to focus the categories of data that will be needed in the study. Case study designs can be applicable in both a qualitative study or a quantitative survey. While quantitative research focuses on the use of numbers, the case study design has been adopted to explore specific details about solid waste management in Lagos and process these data through the rich description of words (Bryman 2016, p.61).

The case study methodology was considered appropriate for this research as it allows the researcher to define the setting of the events that are studied and to provide explanations

for the complex causal relationships that are involved. The viewpoints of some key stakeholders and the interactions between these viewpoints and how they shape the solid waste management system in Lagos State are captured in the analysis of the interviews collected (Johansson, 2007). At each stage of this research, rigorous methodological standards are adhered to, and the theoretical foundations of this research are deployed in the analysis to strengthen the validity of the research findings (Hyett et al., 2014). In addition, theoretical and methodological triangulation reduces the researcher's potential for bias and boosts the confidence with which the results are interpreted. Therefore, this study applies triangulation of the data with the theoretical and conceptual frameworks to establish the meaning of the findings (Johansson, 2007).

The researcher adopted an interpretivist perspective as the interactions between people and their reality often create experiences that can shape their view and result in how meaning is subjectively interpreted within their surroundings. This implies that social actions can be both a product and a source of individual subjective meanings (Bryman 2016, p.26). This is however, different from a positivist view that is often criticised in social research for claiming an objective fact-finding approach with humans as subjects of experiment (Bryman 2016, p.25). That being said, both interpretivism and positivism can be described as scientific considerations of epistemology about what can be seen as the origin of knowledge (Bryman 2016).

The research consists of both an inductive and a deductive model. O'reilly (2011) describes a deductive approach as research that is developed from an already existing theory and further investigated to confirm or dispute the hypothesis. This suggests that deductive research often has its origins within an existing theory (O'reilly 2011). On the other hand, the current study is not aimed at testing an already existing theory. Therefore, the inductive approach within the study is incorporated as the everyday issues of solid waste management in Lagos was investigated and further developed by consulting existing theories during the research (O'reilly 2011).

3.3.2 Ontological Perspectives

The data collection process within this study emphasises the role of social actors in the activity of the solid waste management system within Lagos. This constructivist approach acknowledges how the activity and interaction of people within a system constitutes its functional existence (Bryman 2016). The state, private and household actors are considered within the scope of this research as the functional units that enable the

existence of SWMS within the study location. This view is however in contrast to the objectivism perspective that grants a functional reality to structures that are external to the individual characters that operate within them (Bryman 2016, p.28).

3.4 Sampling Technique and Evaluation Criteria

Purposive sampling was used to recruit interview participants that are directly related to the study and in a similar fashion, peer reviewed articles were selected and cited within this report. Purposive sampling can be considered as an approach in which the researcher selects interview participants based on subjective criteria to enable the research questions to be answered (Bryman 2016, p.410). This study mostly engaged peer reviewed articles that was initially searched on google scholar. The library search engine at Oria was also used to confirm the peer reviewed status of each article that was retrieved and reviewed within this report. The interviewees that participated in the study were contacted through a personal network and I relied on snowballing techniques to recruit more people for interviews. Snowball sampling implies that interview participants suggested other people that are relevant for the researcher to interview (Bryman 2016, p.415). This technique was particularly resourceful in the recruitment of both state and private sector participants.

Suffice to say, the unique limitations of the study design as well as the small sample size within this study do not grant status for generalisation of the research findings. This is however a contested issue for social research to be accessed on the basis of validity or reliability criteria as those can be considered as quantitative terms for generalisation (Bryman 2016, p.390). The study can however be assessed based on qualitative criteria of ethics, rich contextual description, sincerity, timely relevance of the research topic and general coherence within the research (Bryman 2016).

3.5 Participant Recruitment

A surveyXact form was created through my university digital account at UiA was used to inform participants about the purpose of the study and the link was distributed through my student email and social media. An official letter was sent to the Lagos waste management authority, stating the intent of the study as a means to recruit more people to join the interview. Some of the expert participants were also recruited via LinkedIn. The community within the study location was also formally informed and invited to join the research. The interviews included three categories of participants (LAWMA, PSP and household members) which were contacted through telephone calls from Norway. This had

an impact on how participants were recruited or how soon interview meetings could hold, I also observed a curious form of engagement from the participants who volunteered to join.

The total number of eighteen interviewees contributed from the selected three groups in the study. They include five officers from Lagos state waste management authority (LAWMA), the next group were two operators from the Private sector participants (PSP) and eleven Household members. The participation ratio was used as a means to gain more insight from households who are the independent category that the research aims to explore grounds for a more active inclusion. The agency officers also participated to eliminate a biased argument and justify a more inclusive study. The private sector had minimal participation, however, the interviewees from this group are among the major operators for waste services within the study area, and provided more grounded information that enriched the data.

3.5.1 COVID-19 Preparedness Plan

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus that has spread across multiple continents and has had a global impact. The pandemic is an ongoing risk factor that could have resulted in possible physical harm within the research. As a result, measures for physical distancing were observed to mitigate the spread of the virus. The researcher avoided any travel plans that could have contributed to higher disease transmission. The study relied heavily on remote data collection, and participants were invited to join the interview over the phone.

3.5.2 COVID-19 Preparedness Plan for Participants

Initially, the news of the infectious coronavirus disease was said to have disrupted human life and activities in China. Following confirmation of the pandemic's status, the first case was reported on February 27, 2020, in Nigeria. Nigeria declared a nationwide lockdown on March 30, 2020, with immediate effect in three states of the Federation: Lagos, Ogun, and Abuja. This had an impact on how participants were recruited for the current study. It also resulted in the need for adequate arrangements for how the NSD information letter was distributed to the various categories of research participants. As a result, household participants expressed an interest in participating via the surveyXact link, which was distributed via my student email and social media. The letter was sent digitally to both the LAWMA office in Nigeria and the community leaders, as per the recommendation. During

the interviews, no physical contact with participants was made because this exercise relied entirely on digital field work.

3.6 Data Collection

Data can be defined as any information that guides a study in order to answer research questions; thus, it is an important tool in the entire research process (Bryman 2016). It is recognized as a useful resource in this study for investigating the research questions stated in chapter one. Furthermore, there are various forms of data that can be broadly grouped as structured, unstructured or semi structured data (Bryman 2016). While the use of questionnaire or close-ended interviews can be associated with structured forms of data collection, other methods also exist. The unstructured method of data collection can be broadly associated with ethnography through physical field work (O'reilly 2011). Nevertheless, open-ended interviews and other forms of data collection like participant observation can be identified to be semi-structured in nature.

3.6.1 Semi-Structured Telephone Interviews

I conducted semi-structured interviews with the participants over telephone. In a semi-structured interview, the participants perception is the main focus of the interview and open-ended questions used by the interviewer are mostly referenced as a guide (Bryman 2016, p.466). This means that the participants I interviewed were asked to express their opinions or experiences about the topic which made them feel more comfortable to share about other areas that were either omitted or outside the scope of the study, in which case, I steered the conversation to focus on the research objective. After the initial set of interviews, the interview questions were revised to more clearly focus on participant views, perspectives and experiences. The participants were contacted by me through telephone calls that lasted between 25- 45 minutes. I observed that telephone interviews can be convenient for some participants who were willing to connect hands-free and speak in a relaxed manner. Telephone interviews can also be challenging with fluctuating signals that can interrupt the smooth rapport cultivated during an interview. In the few moments I experienced such connectivity issues, I simply called the participant immediately after the incident and they were mostly understanding to continue with the sessions.

3.6.2 Literature Review

According to Bryman (2016), the literature review is a means by which researchers investigate what is already known about the topic. It also provides an understanding about how a particular topic has been previously studied, and what theories and approaches have been used to study it.

Therefore, a substantial literature review of existing knowledge within this area of study was conducted to ensure that the research is grounded among other relevant studies. The references provided in key literature were also consulted as a guide to snowballing other academic sources of data (Bryman 2016). The selected articles reviewed in this research are developed based on solid waste management archives. Therefore, selected SWM discussions for environmental justice, social inclusion, waste management from varied contexts and sustainability were prioritised through the lens of coproduction for this research.

3.7 Analysis Techniques

The term "data analysis" can refer to the examination of both primary and secondary data (Bryman 2016). Primary data analysis is carried out by the same researchers who collected the data. When someone else analyses data, it is referred to as secondary data analysis. When it comes to data analysis, the raw data must first be managed. This implies that the researcher must examine the data to see if there are any obvious flaws. The researcher must also be aware of any potential hearing errors that could affect the meaning of responses (Bryman 2016).

The data analysis for this study was done by identifying topics that emerge from the data into themes (Bryman 2016, p. 585). The process developed through transcribing the various interviews for each participant and assembling the collective data. Thereafter, an initial form of open coding was done after conducting a series of examinations on the data.

As stated in Bryman (2016), coding is the process of breaking down qualitative data into its component parts and assigning labels to those parts. However, as this study mostly relied upon open coding, the process was done in a less iterative manner. Nevertheless, substantial efforts were made to observe the recurrences of major codes across the data, as well as connections between different topics. The various topics were re-examined, merged and formatted to produce major findings within the study. Furthermore, an iterative

approach between induction from primary data and deduction from existing theories were conducted for a more in-depth analytical discussion.

3.8 Permissions and Data Processing

Ethical approval was sought and obtained in Nigeria as well as in Norway through the university of Agder. Permissions for carrying out academic research were obtained in Nigeria prior to any field contact. A dictaphone was purchased and used for the purpose of recording meetings held with participants after they give consent for how their data will be managed. The interview conversations were recorded as a reference to transcribe and reflect over meaning. The data from the interviews was later transferred, anonymized, stored with the Microsoft Onedrive secure cloud data storage manager solution at the University of Agder and deleted from the recorder. The information was solely used for the purpose of this research and thereafter deleted at the end of the study. This is in line with the procedures formally approved by the Norwegian Centre for Research Data (NSD).

3.9 Ethical Self-Assessment

According to the Norwegian national research ethics committees (NNREC, n.d), research ethics are morally binding obligations, values, guides, and cultures of doing scientific findings that can often have legal implications in societies. Research ethics are however not public laws, but they border on researchers, both in committees and research institutions. The study, through the University of Agder, has observed mandatory data protection laws of doing research in Norway and obtained permission from the Norwegian Centre for Research Data (NSD) (UiA, n.d.). NSD approval also aligns with the principle of research ethics to state that the researcher respects the integrity of privacy in how personal data is collected and used (NNREC, n.d). Personal data can be seen as any means or information that makes an individual identifiable such as their name, voice, or background (UiA, n.d.).

The study ensured ethical conduct to be fair and uphold the integrity of participants. The current study aims to add to existing knowledge for an improved waste management system and intends to do no harm, hence the rights of various stakeholders were duly respected. The intended outcome of this study aims to be socially beneficial and emphasise the dignity in conducting waste management. As academic research ought to be a quest for truth, the process for data collection in the study prioritises the verification of information that has been used within the study. The research consulted with mostly peer-reviewed

journals in discussing existing literature in accordance with academic guidelines. Authors from the relevant literatures are duly acknowledged through citation to show the source. The findings from the research are open and accessible for other scholars to investigate further findings. This can encourage the furtherance of the studies, as well as bring more clarity on any misconceptions within the research.

A consent note was forwarded to the participants to inform them about the details of the research interview as well as their rights. The consent form included details like name of the institution, supervisor, research student and the purpose of the research. Participants were also informed about the need to record the interview, and their consent was obtained to ensure integrity of participants' privacy. The scope of the study did not engage minors in society. Only adult citizens were approached and volunteered to join interviews. The data that were obtained during the interviews was anonymized in the cloud software provided by the University of Agder and was not stored on any personal device.

CHAPTER FOUR: FINDINGS

4.1 Introduction

The study was done to find out what are the possibilities for coproduction in the management of solid waste with household communities in Lagos. This chapter is the first step in presenting empirical themes that came up in the interviews and were chosen based on the conceptual lens of coproduction. The data were retrieved using semi-structured telephone interviews and seemed relevant for certain aspects of the research questions. The resulting themes have been transcribed, evaluated, and presented with direct quotes from different groups of participants, such as households, PSP, and LAWMA officials. The three main themes in this section are administration of waste management, entrepreneurship & technology and communicative engagement.

4.2 Administration of Waste Management

The findings reported in this section includes themes that emerged on topics like; private sector concerns, legal enforcement debates, accountability in waste management, recycling centres within household communities. These themes tend to present issues that were discussed in areas that require stakeholders' active involvement. It also indicates administrative issues for how waste is being managed within household communities.

4.2.1 Private Sector Concerns

The Private Sector Participation (PSP) has its key waste management operations in Lagos, Nigeria. As an environmental contractor for the state, they explained that a waste management licence does not necessarily grant an open evacuation permit across the state. However, an assigned community is being allocated in a specific area for a regulated waste service delivery. While some household participants experienced that PSP are not forthcoming, many household members agreed that waste often overflows before the weekly evacuation. The participants generally discussed the inconsistency experienced in their quality of service and delivery. It was observed that some PSP lacked adequate waste coordination within the community. However, one participant did not mention any waste management issues. Some said that even organisational impact from PSP can have

consequences for societal willingness to engage and pay for waste services. A household member said:

> Delays in waste evacuation are a common challenge in my neighbourhood. I do not think most private investors are able to cover enough grounds concerning waste in the state. The waste disposal is not so organised, and we can see waste piling up in the environment because it is usually not recycled or removed on time.

The participant described that waste management solutions are yet to be adequately organised, however the private operators express challenging concerns from an alternative perspective. The operators express that households who patronise private waste services can be increasingly demanding in their expectations for regular waste evacuation within the common limitations realised in society. The private participants narrated that the societal expectations for refuse disposal services are often unrealistic during downtimes like machinery breakdown or static traffic situations in the state. They expressed that a strict household approach for weekly waste disposal contracts is often not attuned to the logistics of transporting waste to already congested dumpsites. PSP operators also seek to invalidate delays in weekly waste collection by recounting periods with more regular evacuation services. PSP consultants described how:

> The business of waste management can be earnestly challenging in terms of massive overhead costs, and when domestic clients are not forthcoming with waste disposal payment. It is especially noticed amongst those private contractors who can lobby to obtain a licence only to experience that it is not as lucrative a business as they had initially assumed.

Private sector consultants expressed incapability to prioritise equal environmental management where patronage of waste services cannot be massively enforced. Waste officers on one hand, confirmed how most contractors might be keen to sign a contract deal with the state instead of the regular waste collection and disposal duties. On the other hand, private actors lamented how the state regulators had been empowered to legally enforce compliance for proper waste disposal to be done in communities. Nevertheless, the operators claim that this has not been realised as officers of the state agency also express limitations in enforcing waste regulatory laws in society. Another operator seemed agitated that ineffective waste workers are debasing the sectoral reputation of others who actively engage in waste management issues within the state.

4.2.2 Legal Enforcement Debates

PSP participants mentioned how state laws and governmental policies could be more impactful concerning waste management activities. The operators bewailed an administrative failure of officers to enforce environmental laws in communities where defaulting payment issues by waste offenders reside. As an operator, they contend that they are not lawfully empowered to enforce sanctions on those who do not pay garbage disposal dues. On one hand, several household participants lamented the issue of inadequate waste control from both the state and the private sector. On the other hand, private waste workers said it is not within their waste management scope to prosecute those who commit environmental crimes like open burning of waste practised among the masses. However, a household participant re-established the need for progressive attitude in waste management even though state leadership can experience refuse situations as overwhelming.

Household participants complained about an inexistent follow up inspection from the state agency within the household community. One household participant gave an account of such gaps in narrating the experience at work and place of residence. According to the participant:

> The company I work with, engages several private disposal companies to comply with environmental laws in Lagos. The state agency regularly inspects waste disposal at the workplace. but this is not the same in residential areas.

The participant's call for accountability in the legal framework of waste management is presented amongst other challenges. Nevertheless, it was mentioned by both agency and household participants that enforcement agencies experience compliance and sanctions to be more effective in structured commercial areas. Whereas in the residential areas, households usually have alternative ways for waste disposal by openly burning their waste, they said.

According to a waste officer, "it is not impossible for inadequacies to exist within state machinery if an adopted policy by the institution is not applicable to contextual waste needs within the state". The agency expert acknowledged that policy reports for solid waste management can be better formatted to engage with society. Agency experts affirmed that the community is essential when thinking about climate policy for environmental issues. Waste officers declared State policies as crucial for how waste management can be contextually executed with other members in the community. In the end, they seem to agree

that society needs to be more engaged in environmental issues and avoid indiscriminate dumping of waste.

4.2.3 Accountability in Waste Management

Household participants expressed the need for accountability in the societal waste management system. One or two community members expressed the need for household complaints about compounding waste issues to be approached with more urgency. Another community member shared a similar view for waste generated in society to be adequately recorded and at least annually updated to track waste cycles in the state. They called on private sector participants to update waste data, identify peak periods for evacuation and offer better disposal services. The household participants expressed their concern for a well-structured waste system that is effective to issue receipts for their services rendered or deliver sanctions for noncompliance. Household was of the opinion that trucks should be properly covered so the waste does not spill over and end up in the drainages. Another household said that there should be adequate channels to communicate household waste issues within state management.

Private sector participants on the other hand, protested a public view they said has failed in their opinion, to reasonably accept paying for waste disposal services. Instead, an opposing household view argued that they have done their civic duty of paying individual taxes to the state. The operators argued that:

> Waste services are already subsidised by the state government, and citizens cannot continue to stand by for the state to independently resolve common issues in their surroundings.

An operator's interpretation of this statement was that environmental management can be viewed as a state issue; however, the community needs to be proactively engaged to ensure optimal trash evacuation in society. The Private sector participants mentioned how they are motivated to improve their environmental work with considerable incentivised returns on investment.

Nevertheless, the consultants in the private sector acknowledged that most commercial and household clients are willing to pay for waste evacuation services. The private operators said that most household clients expect an optimal waste disposal service. Some of the household participants agitated that the environmental partnerships with private actors are

yet to be offered within the views of public service standards. Several household participants complained that waste disposal services are yet to operate equally across social stratification. A common household view was that environmental cleanliness should be all-inclusive and should not be divided by issues of class. One of the household participants was of the opinion that:

> Reliability is a function of involved parties being able to depend on each other to effectively participate in waste management issues.

The household member mentioned the elementary need for reliability between the state and the civic community for sustainability goals. Some other participants raised the need for a joint approach towards confronting the issues of waste and incentives to reward societal collaboration. They said it can enable more provisional options for managing waste. Another PSP consultant said that households can also take the initiative to segregate waste for disposal companies to collect them for more resourceful takeout.

4.2.4 Recycling Centres Within Household Communities

Several household members shared the experience about the lack of a proactive waste administrative system that can introduce mechanisms to address waste production, before they become trash. Another household lamented over inefficient waste management administration for society to learn and earn from waste resources. The participants opined that society should be enabled to see the implication of negative waste practices and they also need to be encouraged with incentives. They mentioned the lack of reinforcing incentives for recycling waste. Several households lamented the lack of adequate recycling centres that are accessible to residents and provided by waste management structures. Other household participants posit that the citizens can play a more active role if the infrastructures are provided by the state. Most participants called for gaps in waste management to be addressed in areas like the existing recycling centres. They explained that collaborative waste management within the state laws needs to be encouraged broadly and firmly installed. The participant said:

> Rewards can be given in the forms of incentives like a coupon or token that people can exchange for value. There should also be sanctions in cases of non-compliance.

Household participants described recycling as a tangible avenue to engage community waste management needs within the state. Some of the LAWMA officers mentioned how

recycling can be easily done by households that are mindful about the environment. One of the household participants argued that this might not always be the case. They said that there are others in the society who are yet to be informed on how to recycle their waste. The expert maintained this as an avenue to steer motivation in society by carrying out practical demonstrations on the spot for all who are there to see. The experts quoted that:

> Recycling can engage society in waste awareness as waste education can inspire more recycling culture within society.

Therefore, if recyclable products become more tangible in the society, then people will be able to see for themselves and understand the relevance of recycling as mentioned by the experts. Private sector participants said that households in high-end neighbourhoods mostly have domestic staff who manage the waste generated in the house, and they too will be encouraged by an incentive for the waste handling that they do.

The Private consultants mentioned that much more needs to be done than verbally telling people about waste management benefits. The operators noted that by incentivising better waste practices, even society members beyond their neighbourhood will be motivated to spread the word for waste to be appropriately deposited for recycling. The PSP consultants mentioned how certain households have a coordinated system where they ask people to deposit their plastic waste at a designated area and it was observed that most people are already complying. When asked about a private initiative to encourage community integration in waste management, all private operators mentioned how it can be challenging to orient society. The operators then said that a process is being designed to engage a smaller community of households within organised estates and soon they hope for the word to spread about recycling.

4.3 Entrepreneurship and Technology

Enterprising waste concerns and technological views emerged as relevant themes from the transcribed interviews. Issues around innovation, awareness, waste generation, collection, reuse, recycling as well as recovery seem to have a consistent recurrence within the data. The discussion within the data seems to highlight key elements that were identified based on coproduction.

4.3.1 Enterprising Waste Concerns

Household participants commented that waste is yet to be fully reoriented as a valuable resource in society. A consultant said that they sometimes seek opportunities to trade recyclable waste. While household participants mentioned that the activities of enterprising businesses in waste management is yet to be fully harnessed by the state. Another PSP operator said:

> If you sensitise Lagosians to earn from waste, they are interested in an enterprising venture, and they will key into it.

The operator meant that local recycling within the state will not only encourage a green economy, but it can also engage more youth in environmental affairs. The agency acclaimed that marketable value of waste can be explored for employment and job creation for the masses. An expert mentioned that more machines for recycling and waste pick up are now being manufactured within the state. Other experts expressed this as an economic breakthrough for locomotive waste management to be done without engaging with expensive exchange rates for importing garbage disposal trucks.

However, an operator said that the duty and responsibility for the environment should not always be introduced in terms of economic incentives to society. PSP consultants mentioned how the key motivation can be to provide a better understanding about the environment. The consultants described how an environmental perspective that relies solely on incentives might not be a sustainable source of environmental momentum. Some of the participants said that:

> Waste materials can equally be used as instructional tools to teach about topics like compost and reorient perceptions about waste.

They seem to have a resourceful perspective about more ways of utilising solid waste. Another household participant mentioned how corporate institutions like banks endeavoured to address issues of paper waste. Most of the participants agreed that public attitude towards solid waste like paper is becoming more positive compared to past experiences. They all mentioned a need to encourage society to benefit from waste management practices.

4.3.2 Technological Views

Most of the household members perceived social media as a resourceful tool to enlighten society about waste reuse. Some participants excitedly said that they experience its influence in the way people coordinate waste initiatives. They observe this through online ads from small businesses that do recycling. Another participant said it can be an accessible tool for learning about new environmental trends in online news. A waste management consultant also mentioned the use of ICT in forms of messaging platforms like WhatsApp groups, where their household clients can comment feedback or send complaints for a more instant response. LAWMA experts buttressed the argument by introducing Lagos recycle initiative in which households are encouraged to sort their waste from source. They said that an app was also introduced for people to register if they have recyclables and the responsible unit within the agency is designated to recover such materials that are registered through the mobile app. According to the expert:

> Currently, households are expertly being informed and recruited to register their recyclables to be collected by LAWMA through the PAKAM app.

The agents said that the app called PAKAM was a useful tool for organising recyclables.

Nevertheless, household participants seemed double minded about how the sudden mobile app can fix complex realities within the state. On one hand, most of the participants said they have not heard about the novel initiative about state recycling apps called *PAKAM*. Some of the participants admitted to not using it despite LAWMA introducing it by TV media. Others expressed a distrust orientated towards ICT solutions for social issues. One or two participants criticised how effective or efficient it can be to resolve communal waste needs. On the other hand, household participants seemed optimistic about the capacity of ICT as a tool for environmental administration. They said it can be useful to explore how the sorting issue of waste can be done through the application for waste evacuation. The waste experts then agreed about the low awareness level concerning the app and the need for continued sensitisation among the public. However, the officers reported more community response in areas often regarded as low-income neighbourhoods.

Furthermore, the waste agents mentioned how class and income gaps can impact the effectiveness of ICT initiatives or incentives. An expert interpretation was that registering plastic waste on apps for state incentives might gain a debased response. Other experts agreed that society can assess the government by their ability to do better and

become sceptical about data protection laws for profiles located on such apps. Experts proposed that ICT solutions can be developed as a means to end societal problems of waste. The experts later acknowledged that the new application can be improved for more efficient waste recovery.

4.4 Communicative Engagement

In this section, reports on conflicting informative debates, campaigns for awareness and proactive sensitization, as well as community engagement, are sub themes that seem to have emerged from the available data. Issues narrated within the data tends to indicate the centrality of communication while highlighting reports on household engagement.

4.4.1 Conflicting Informative Debates

Household participants expressed the absence of a direct information flow between them, and the waste management companies. Although some of the community members admittedly gain access to the dumpsite, others said they prefer to collaborate with neighbouring households to pay for organised waste evacuation. The participants, however, lamented that they are often not informed with any reason when disposal companies are unable to come for routine pickups. They mostly considered this as an irritating issue to complain about, another supposition was how it could occur due to a delay in payment. One of the interviewees said:

> I have not been able to interact with the PSP since I moved in as a tenant, I just assume it is due to their late-hour operation.

The gap in communication experienced by the participant tends to be addressed as an excusable norm in their line of duty. On a different note, some said their landlady or facility manager can reach out to the disposal companies or approach their truck during weekly evacuations. However, the private sector participants reported that:

> We interact with households individually through the use of newsletters and in clusters during community meetings.

The operators' reports seem to contradict how households perceive communication in waste management. Another consultant then mentioned the existence of a more personal

information flow between private sector operators and domestic workers in household communities. The state agency affirmed that:

> There are channels by which the community can access the state government or LAWMA. The community development chairman (CDC) is also passing information within the community. We also have phone lines for people to raise their views. There are seminars that the agency organises for different areas, and people can give feedback during such events. People can use the PAKAM app.

The agency experts claim that society can also be responsible for how communication in waste management is being done. However, most of the community members said that they were not directly involved in how waste management is organised in their neighbourhood. While some got to know about disposal companies through neighbours, others mentioned a pre-existing contract within their housing agreement. Household participants also mentioned that these arrangements can be decided by the owner of the house (landlady or landlords) where they rent. Facility managers within the community were also mentioned during discussions about such arrangements. While others community members said it was not an engagement that they are keen about due to similar inefficiencies in waste disposal services.

4.4.2 Campaign for Awareness and Proactive Sensitization

Household participants protested the insufficient waste management information and awareness in society. They said:

> Even a layman in Lagos should be able to learn about waste management practices as well as the consequences for defaulters.

They explained this as a need for accessible and updated information about the environment. Some of the household participants rallied for more enlightenment in environmental laws and enforcement. Other participants agitated for sensitisation concerning the dangers of improper waste practices. An operator acknowledged the limited environmental sensitisation and active law enforcement. The waste consultants mentioned that the media is yet to be fully utilised as an avenue to encourage environmental awareness. Waste officers agreed about the use of media to enlighten and engage society through mediums like TV & radio stations, social media, billboards, ads on disposal trucks and '*danfo*' (commercial buses) or even through animations aimed at the

younger generation. All participant groups displayed a common concern about communication issues in mixed societal and academic backgrounds. They presented a complex reality that can benefit from the use of local languages for environmental sensitisation. One household participant described Lagos as “the melting point for several tribes in Nigeria" and media announcements can be done in various local languages. Stating that indigenous languages like Yoruba, Igbo or Hausa can be resourceful for an attentive media audience. They also mentioned these forms of media like- print media, social media, TV, radio jingles as a means to reorient the citizens. One community member said:

> What we see, listen to or hear every day can form part of our culture and Word of mouth can help to spread new norms about waste in our surroundings.

The participants narrated how the lack of awareness can be addressed through visual and verbal awareness. While some household participants lamented the lack of sufficient recycling and enlightenment campaigns for an improved waste experience. Other participants argued that this might not accomplish mass inclusion. Especially for those who currently do not know any better about environmental issues. They however agreed that it can impact the education of waste management within the state. The operators said that each PSP company can also contribute more to sensitisation as a form of corporate social responsibility.

Nevertheless, one or two households contended that awareness doesn't necessarily translate to a change in behaviour. A household participant disapproved of passive awareness that intervenes after the hazard of indiscriminate dumping has already occurred. Most of the household said the waste management system needs to effectively communicate climate concerns to residents in the state. Some of the household participants were concerned that seasonal awareness campaigns can be easily forgotten as waste is littered in public haphazardly. A household view argued that awareness is often romanticised and probably not as effective.

Another informational issue mentioned by households was other forms of relentless advertising that often encourages consumerism. Their concern was that there are rarely any ads that teach about waste management or environmental consciousness. Several household participants clamoured for the role schools, industry, businesses and other

organisations are yet to play in mitigating misinformation about waste. However, a community member highlighted that:

> The younger generation in low-income households are almost excluded from gaining any formal knowledge about waste management. A non-governmental organisation (NGO) within my neighbourhood encourages access to environmental education, parents are able to send their kids to school, while tuition is deposited in terms of recyclable plastics.

Such an initiative described by the participant provided accessible education while advocating environmental awareness. The participants stated that society needs to be educated about the consequences of environmental degradation and how it affects them and impacts their livelihood. Household participants advocated for waste governance to sensitise through diverse means like music and even the entertainment industries. Some waste officers, on one hand, highlighted the effective motivation of sanctions. On the other hand, another household participant suggested the use of watchdogs to make examples of defaulters. However, some household participants highlighted systematic issues in loose terms as they proposed a social change that is anchored on rewards or results. In the end, they championed the importance of awareness and enforcement for people to take responsibility for their waste.

4.4.3 Community Engagement

The issue of segregating waste was argued in a collaborative way by all participants as waste collectors cannot be expected to do this alone. Community members said that there has to be more collaboration to integrate households in waste management systems. Some household participants complained about the lack of sustainable partnerships. Over six community members perceived a disconnect between the waste management structures of the state to accommodate the realities of the city landscape. The household participants raised the issue of insufficient engagement between the waste management system and household communities. One or two community members agitated for the local government to improve its relationships with the leaders in wards to ensure that societal waste is well organised. Generally, households addressed PSP operations as middlemen between the government and societal waste issues. One household participant said that:

> Lagos state has a waste management partnership between the state and the private sector. PSP removes the waste for a fee and the state also manages to cut direct costs. But waste is still being dumped at construction sites, contributing to water logging issues within the state.

They meant that waste issues cannot be isolated and resolved by a one-sided waste disposal network. Household expressed their concern about inefficiencies in how PSP services are being lobbied and allocated. Community members observed that it can be easy for more offenders to litter when the environment is already dirty. However, PSP consultants mostly viewed recycling activities in terms of extended partnerships. The operators mentioned that their waste contract licences them as the primary unit for evacuation of waste in specific communities. The private sector operator then implied that other interests for recycling waste can engage them for permits to collect waste generated within allocated communities. Nevertheless, the operators said that societal participation should not be overlooked as some clients who are informed about the environment and waste, insist on making the full payment for disposal even after sorting out their waste.

Another segregating issue from some community members was about smaller households that may not have the capacity for multiple waste bins used for sorting recyclables. The participants said a collaboration between the household and the state can be conceived in a broader approach. This is to accommodate various views on community inclusion in state environmental policies. Most of the community members proposed that the state engage and support the capacity of households to access bigger waste bins for the volume of waste that they generate. Community members also said that manufacturing companies should promote more incentivised initiatives to encourage the recycling of plastic that they often produce.

Household participants generally discussed the lack of environmental support groups and associations within the community. They pointed out that indiscriminate dumping of waste can have an adverse effect on societal health. Therefore, there should be avenues for citizens to come together and share their experiences and responsibilities for environmental management. They opined that sensitisation should be encouraged to include the community networks. Some household participants said that the landlords can be helpful to establish rules that govern waste practices in tenancy agreements. The expert also mentioned that the leadership in Community Development Associations (CDA) need to also be sensitised for effective followup within the community. The households described

how this can improve compliance to recommended waste disposal forms within the household community or sanctions can also be applied. One participant said that:

> Neighbourhood coordination for handling waste is essential for us to tidy and maintain a more friendly environment. Other organisations can also participate and enlighten the community about waste management practices. It is important for people to join efforts and improve waste management.

Their argument at the end of the day was that the commission of waste management for the environment can be effectively achieved in collaboration with household communities. Several community members encouraged the farming of areas that are fallow and exploited as a current wasteland for dumping refuse. Others said that garbage dumps can be transformed into tourist sites to improve societal aesthetics in an environmentally friendly manner. The household participants mentioned that cultural background can be influential for how societal practices around solid waste are performed. The participants mentioned that cultural practices can influence households as well as the experience within the larger society. Another participant referenced traditional rulers as an indigenous means for people to learn about the environment as they are often closer to the people than the central government. The household participant expressed that such changes about the surroundings can be passed to future generations as an endearing cultural trend.

CHAPTER FIVE: ANALYTICAL DISCUSSION

In this chapter, I will analyse and examine the findings reported in Chapter four in relation to the research questions stated in Chapter one and the methodology stated in Chapter three. Semi-structured phone interviews with selected participants produced primary data, which was presented using themes derived from interview transcripts. The previous chapter's findings were reported separately in order to organise and clearly set out the data derived from the research methodology. This section will discuss the analysis, which is mostly qualitative in nature and expressed through words. As a result, the recently presented data in this study will be thematically analysed and engage with the theoretical framework, in an attempt to answer the restated research questions.

5.1 Main Research Question

In order to find out: What are the possibilities for coproduction in the management of solid waste with household communities in Lagos? The following perspectives emerged based on the key concept of coproduction discussed in chapter two of this study. These viewpoints seem to be also linked to the introductory background of sustainability, which drives the arguments presented in the literature review and illustrated in the theoretical framework.

The possibilities for coproduction in the management of solid waste with household communities in Lagos can be seen in- How the selected stakeholders in solid waste management system perceive avenues for a participative integration of households. It can also be seen in how interactions in SWMS are improved to include households in waste services in Lagos. Although households are seen as a minority, they majorly operate within the elements and aspects of the theoretical ISWM framework.

In this manner, this study was able to answer and understand why coproduction is relevant. It can also be seen in the theoretical framework that it is possible for coproduction, to unite stakeholders' collaboration around the waste system elements of ISWM and emerge in various aspects of the PESTEL for sustainability to be achieved.

Having discussed the possibilities for coproduction to effectively work in the ISWM for sustainability goals, the subsequent analysis will enquire and therefore attempt to discuss diverse issues that are relevant to answer ensuing sub questions.

5.2 Sub-questions:

The following three sub-questions were initially introduced in chapter one of this report and the corresponding answer for each question will be discussed within this chapter. They will be answered based on the various theories discussed thus far to illuminate the initial answer provided in the main question. These sub-questions include-

I. Why is the role of households relevant in SWMS?
II. How can the interactions in SWMS be improved to include households in waste services in Lagos?
III. How do the selected stakeholders in solid waste management system perceive avenues for a participative integration of households?

These questions will therefore be answered, and attempts will be made to further elaborate through an analytical discussion of each question-

5.3 Why is the role of households relevant in SWMS?

The relevance of this sub-question is based on the missing role of household among the existing stakeholders in the initial theoretical framework. Households that can be identified as a socio-cultural group appeared to be historically non-existent, and thus equally marginalised within the previous framework. Even though they now appear to be coming in after the previous stakeholders, the importance of their inclusion in driving the administration of solid waste management system in Lagos towards sustainability cannot be overstated.

5.3.1 Administration of Waste Management

According to Zhang et al., (2022), government regulations can bridge the gap between waste management techniques and performance. State regulations that are geared towards the inclusion of households can help to reduce private sector dominance issues while also providing for administrative checks and balances within the state. However, delegating waste disposal responsibilities to be solely executed by the private-sector actors may limit effective waste management coverage. Most household participants may perceive this as a

limiting system in a situation where the private operators remain ineffective. Therefore, households should be recognized as a vital unit for pro-environmental engagements (Reid et al., 2010). A participatory waste management sector can ensure that diverse actors/ stakeholders involved in the handling of waste can carry out their waste management responsibilities. This can include activities like ensuring optimal sanitary measures in waste handling and evacuation both within the household and across the state.

However, as most participants acknowledged, the ability of private-public partnership to sufficiently attend to public needs and services tends to be limited. While the waste administrative model of working with private actors allows the state to outsource waste management, it also raises accountability concerns about how waste affairs are being handled within the state (Vasconcelos et al., 2021). Wadehra and Mishra (2018) discussed how compliance and enforcement efforts in the waste management sector require adequate harmonisation of both public laws and private policies. As a result, when private actors are involved in the delivery of public goods in environmental management, it is frequently necessary to review their execution plans for the public service they are contracted to provide. It is also the responsibility of the state to establish an enabling environment for the achievement of a participative and collaborative public good. Nonetheless, the task of garbage disposal is widely assumed to be environmentally conscious. As a result, an integrated solid waste management system is important for lowering greenhouse gas emissions generated within the state (Menikpura et al., 2013).

According to the study's findings, both the public and private sectors noted a lack of adequate funding and resources for an effective and efficient solid waste management. Therefore, considering the predominant role of the state in facilitating the means and process of effective solid waste administration within the state, it is important to question the priority assigned to environmental waste management issues. Households, as a dynamic group that can be equally responsible and accountable to, are frequently the victims of systematic failures. Waste management systems tend to foretell the garbage disposal process, and homeowners are merely on the receiving end of predefined legislation. Such an omission is described by Noufal et al., (2021) as the outcome of deficient appraisal and conceptualization of the role of households in the solid waste management system. Nevertheless, involving grassroots groups in decision-making processes is not without complications. A bottom-up strategy in the complicated activity of waste management, on the other hand, is said to be richer in long-term benefits. It is also a pertinent topic for waste management interventions aimed at achieving long-term solutions around the world,

particularly in non-Western societies. This can also be used to support democratic debates about how environmental laws are often neglected or disguised into greener economic agendas (Guerrero et al., 2013).

While the role of effective environmental laws cannot be overemphasised, it is also parallel to tactful measures for implementation. According to Raven et al., (2021), the social environment can significantly impact the success or failure of policy initiatives. That is to say that the issue of enforcement should not be deliberated in a homogenous manner. The tone of legal enforcement within the interviews suggested ruling waste management compliance with the rod of sanctions. Nevertheless, all participants seem to be keen about how waste laws can be effectively implemented. The goal of enforcing environmental laws should not be addressed as an avenue for tyranny to dominate communal dwellings. Enforcement of proper waste disposal procedures can also be advocated as a matter of justice, to be supplemented with appropriate sanctions (Kubanza & Simatele, 2016). Both the state, private and household participants were broadly mentioned as defaulting cohorts in various aspects of the environment. The lack of adequate public bins, poor coordination for waste removal and indiscriminate dumping of waste are few issues that emerged across board for all actors interviewed. As a result, there is a need to ethically address the narrative of who pollutes and who is assumed to be rescuing the environment (Kubanza & Simatele, 2016). It is, however, a general ethical issue for environmental justice to be considered while addressing pollution in the environment. The issue of the polluting south can also be addressed in terms of deregulatory laws that exacerbate production and consumption patterns across intercontinental borders. Individual ecological footprints might be ethically acknowledged as a foundation for coproducing environmental practices by development agents who reach out through environmental partnerships and institutions. Waste management in this regard, tends to disavow grounds for narrowly focused top-down approaches in administration or leadership forms. However, an alternative bottom-up measure can indicate a gradual progress for environmental justice to be achieved (Gutberlet et al., 2017; Kubanza & Simatele, 2016).

In solid waste management, the problematic one-size-fits-all strategy seems to be an issue for the case study participants (Adams, 2009). On one hand, household members complained about a lack of sanitary inspections by governmental entities. On the other hand, the agency mentioned the difficulty of conducting inspections in unorganised neighbourhoods as opposed to organised industrialised areas. This may appear to be an obvious concern for town planning in a fast-urbanising culture, it also emphasises the

necessity for a contextual approach in how environmental measures are regarded and approached in different situations. Commercial areas that exist as economic hubs seem to indicate the centre of interest for waste activity. The perceptions about consumerism and capitalist interest may seem to be on the side for coproduction. However, it is central to solid waste generated in household communities and there is a need to deliberate how such attitudes and pursuit for economic gains can be relinquished for sustainability goals to thrive. Nevertheless, the aspirations for a circular economy seem to present a practical approach for how waste can be collectively sorted at the source and reused as raw materials away from dumpsites (Vaccari et al., 2013). This also emphasises the key role of households in sorting challenges of solid waste systems.

Accountability in solid waste management administration is critical for building trust in societies and waste management leadership systems (de Feo & de Gisi, 2010). The desire for accountability in waste management can also be translated as a need for responsible systems that the society can rely on to address the waste difficulties that they face on a regular basis. Insecurities in the environment, as well as other areas such as societal health and well-being, can be exacerbated by a lack of trustworthy management (de Feo & de Gisi, 2010). Co-producing waste management services with active public participation, can pave the way for mutual trust and reliability to grow. The state, as well as public and private residents, could perhaps work together to address the issue of proper waste management. Leadership in waste management may involve household communities in a more transparent manner. They can account for how trash is managed, allowing society to engage in accounting for individual waste behaviours (Ma & Hipel, 2016). It may promote more engagement if households are provided adequate documentation of how their garbage is treated. Transparency in leadership is essential for achieving positive outcomes in both local and regional development. Development efforts can even fail if local communities do not trust their aims. It also allows for reflection on projected intents and ensures that the public good remains the focus of such actions.

According to Meng et al., (2019), while dealing with administrative waste management difficulties, it can be very beneficial to engage citizens through waste management frameworks. Recycling centres within household communities not only inspire physical forms of participation, but they can also serve as a kind of visual reorientation. The participants from the agencies described how it enables them to conduct a participatory demonstration of actual trash separation. Recycling centres can help society recognize waste as a resource. However, in some circumstances, recycling facilities may be viewed as

an imposition of foreign norms (Zhang et al., 2022). Consequently, most of these facilities may be ignored or, in severe circumstances, vandalised. Kaplan Mintz et al., (2019) emphasise the need to include cultural aspects in waste management methods as both structural and cultural factors can make people more likely or not to recycle and reduce waste. Therefore, when introducing a new concept, it is critical to consider a contextual approach. The effectiveness of public systems is influenced by societal norms and public perception (Zhang et al., 2022). Recycling centres cannot be viewed as a panacea for the community waste management crisis within houses. Such steps can be implemented to stimulate the coproduction of effective waste disposal systems. Similarly, development ideas can be used as a guiding tool throughout project inception and planning. Contextual knowledge and norms are critical for determining when and how development tools can be used or relied on. There are other approaches that are mostly ignored due to an emphasis on the foreign approach to recycling. Some of these alternatives include reusing, composting/rotting, and upcycling, which are all participatory approaches to trash reduction. Composting, for example, will help to reduce the amount of garbage generated if approximately 45 percent of Nigerian household waste is organic. As a result, solid waste items can be sorted without being mixed with other types of waste (Kumar et al., 2018).

As a result, the first sub-question appears to have been addressed and discussed in this section. The role of households appears to be important in solid waste management system, as evidenced by the examples provided in the preceding discussion. Households can help to strengthen waste management administration if they are adequately included in Lagos' solid waste management systems. They can participate in a pro-environmental engagement form to ensure adequate checks and balances. Their involvement could even result in a more sustainable partnership in the performance of waste management duties. Which could also foster trust and accountability in a more bottom-up participation model in which households are not relegated and marginalised in SWMS decision-making processes.

5.4 How can the interactions in SWMS be improved to include households in waste services in Lagos?

The results that emerged in the findings chapter provided an in-depth report of how the interactions in solid waste management system are experienced by household participants. Therefore, a conceptualization of the results through the lens of coproduction and by including the innovative elements in the theoretical framework. The experiences and

possible avenues for improving interaction among the new stakeholders in the SWMS of Lagos, were indicated within issues of entrepreneurship and technology.

5.4.1 Entrepreneurship and Technology

It is seemingly common to discuss effective waste management based on availability of advanced economics resources (Rathore & Sarmah, 2020). However, in the real world of reviving economies, where poverty and impoverished societies keep growing, waste businesses can be a beacon of hope for survival (Ezeudu et al., 2021). Members of society can start small businesses which can enable the public to positively interact on waste management issues. Businesses in the area can be encouraged to reuse waste resources that can be turned into raw materials at an arguably lower rate. It could also be a way for local creativity to grow because some local artists are already using waste materials to make art within the study location. The possibility that household waste can be reused locally can make people feel like they have a stake in waste management. Allowing people in society to earn from the waste they generate can also make it easier for households to sign up for and pay for garbage disposal services. As stated by Sotamenou et al., (2019), those who can afford to subscribe to the use of waste trucks are often not in the practice of disposing waste illegally. The state and society, stands to benefit from these regenerative loops when they work together. However, powerful individuals can easily take advantage of this method to their own advantage. They can take advantage of these entrepreneurial avenues for their own benefit. State regulations, on the other hand, are a good way to keep and encourage local ideas. In these kinds of situations, the state's top-down approaches can work with bottom-up ideas in a vertical way (Fadhullah et al., 2022). Such an approach could allow the state to get to know the problems that local businesses face, and together, they could come up with legal ways to solve them.

Most participants discussed how technological advancements can aid in waste management. This tends to align with Zhou et al., (2021) suggestion that stakeholders can collaborate through real-time data reservation and data tracking on an information sharing platform so that legislations can be amended or made more socially beneficial. Platforms based on the internet can be used to educate homes and promote waste-reduction initiatives. It can also be used to rally community support for environmental causes in general. Mobile apps, such as the one described by the participants, can also be used by society to alert authorities in areas where there is a massive waste crisis. Citizen initiative can also be found on new, cutting-edge platforms that offer new ways to think about the

environment (Padilla & Trujillo, 2018). The use of smart bins can also be explored to reduce overflowing waste and ensure fast evacuation within advanced contexts. It is critical to emphasise at this point that technology, for the most part, serves as a tool that can be contextualised to match the reality of the application area. As Ma & Hipel, (2016) demonstrated previously in this study, the efficiency of a solid waste management system is dependent not just on technological innovation, but also on public support. It also suggests a path for more localised research on technical possibilities and their inherent limitations. Given the rapid impact of globalisation and expanding technological consumption, it is vital to account for the massive streams of e-waste that societies are presented with. Household garbage cans are sometimes the destination for solid e-waste, which could have unknown radioactive effects on human health. E-waste is a form of solid waste that is hazardous to both human and environment and a gap in awareness level of citizens further exacerbates the impact within a growing population (Miner et al., 2020). Adequate care can be taken to guarantee that such hazardous waste is disposed of and collected in a safe and environmentally friendly manner. Technological progress must not come at the expense of human dignity or life. Data protection regulations can have a big impact on how family and societal privacy is recorded on technological platforms. To reiterate, Ezeudu et al., (2021) posits that non-state actors in waste management can also help introduce innovation through information and communication technology (ICT) and change public views on waste more quickly. Therefore, it is applicable that ICT can potentially influence the reorientation of environmentally friendly behaviours during development endeavours. It is also worth emphasising that an over-reliance on technological solutions for waste management can be discriminatory in communities who simply cannot afford such gadgets.

Accordingly, it appears that interactions in solid waste management systems in Lagos can be improved to include households in waste services. Based on the discussion thus far, small business ideas centred on waste resources can be developed. This can help to alleviate poverty while also empowering residents to actively claim ownership through the reuse of waste materials. Furthermore, ICT appears to provide an avenue for households to participate in waste services in Lagos. However, it was discussed that both entrepreneurial interests in waste management and ICT solutions should not be uncritically relied upon. Adequate policies can also help to ensure that they are a viable option for inclusion. As a result, the second sub-question has been investigated, and further efforts will be made to explore the final question.

5.5 How do the selected stakeholders in solid waste management system perceive avenues for a participative integration of households?

The prospects for active inclusion of households in the SWMS of Lagos were indicated by the findings and includes administration of waste management, entrepreneurship & technology and communicative engagement. While administration of waste management, entrepreneurship & technology have been discussed around the stakeholders and elements of ISWM. Communicative engagement can be actively promoted in all areas as it is relevant for the various stakeholders to optimally coproduce in the solid waste management system of Lagos. More discussions on Communicative engagement will help in connecting these prospects to relevant literature to gain broader interpretations.

5.5.1 Communicative Engagement

The flow of information was perceived by the participants in a variety of conflicting ways, emphasising the significance of responsible coordination. Waste management personnel are responsible for organising and mobilising an effective and efficient system in partnership with members of society. As a result, they are compelled by duty to facilitate and encourage social involvement, which can also be beneficial for the environment. Consequently, Zhang et al., (2022) outlines the role of effective communication within a progressive and collaborative leadership system. Environmental agents should encourage society to participate in the waste management system through the relevant informative channels outlined within the findings. According to de Feo & de Gisi (2010), community members can oppose the construction of waste facilities due to misinformation, which supports the authors' findings that misinformation can indirectly contribute to protests. The availability of informative channels cannot be expected to speak for itself unless they are utilised in the intended manner. Although this does not always result in inclusion, it does open the door to discovering what does not work and what other approaches of environmental management are feasible. As subscribers to waste management services, society, on the other hand, has the right to actively engage and the duty to investigate the information provided by environmental workers. Household communities have a civic responsibility to uphold the law and promote general well-being in their communities. To realise coproduction, all actors in waste management operations must ensure an effective and efficient information flow (Cepiku

& Giordano, 2014). This is a crucial step toward empowering development recipients by ensuring that community voices are heard, and that people are encouraged to share their perspectives. Individual experiences can also provide beneficiaries a sense of inclusion in the environmental management process (Vučijak et al., 2016). In waste management, effective information and communication flow can also be employed to ensure that society receives adequate support for the unique challenge that they face. Communicative strategies may appear to be a stretch during participatory decision-making procedures. It can also be a concern if power dynamics between professional opinion and indigenous knowledge take precedence over such processes. Nevertheless, environmental issues are central to the activities of both the elite and marginalised members of the community. As a result, it can act as a focal point for ensuring that solid waste management issues are highlighted and managed in an equitable manner.

All the respondents advocated for increased awareness. Regardless of ethnicity, class, or gender, the crucial role of formal and inclusive education persists (Gutberlet, 2015). The participants agreed with the view that it is beneficial for society to be educated about waste management in their surroundings. However, it was argued that conventional approaches to awareness need to move beyond purely postal form and actively educate varied societal groups about the importance of climate issues and how they can be linked to everyday activities both within and beyond the household unit. Wang et al., (2020) confirmed that an increased awareness does not always translate to environmentally friendly practices. Households and other members of society can be better prepared to participate in environmental debates (de Feo & de Gisi, 2010). The process of coproduction is often involved with capacity-building concerns. Knowledgeable residents can try to self-govern how solid waste issues are handled in their neighbourhood (Ejigie, 2008). Engaging society in a proactive way can also help people think in a similar manner when there are environmental disasters or waste crises. They can also learn vital skills that will allow them to make informed decisions in the event of an environmental emergency, such as the disruption which was due to Covid-19. In addition, they may be better able to learn from previous crises and come up with new ways to deal with the structural limitations in their environment. Building the capacity of community members is also essential for a successful development intervention. As a result, there are greater opportunities for long-term growth if households and the rest of society can contribute to the advancement of the community. Nonetheless, postal, and

other forms of vocal awareness might provide an opportunity to retain an already existing awareness (Ejigie, 2008).

In general, the existing forms of partnerships in Lagos's solid waste management presented difficulties for household members. Civil and state actors both play critical roles in achieving development (Ma & Hipel, 2016). One major discovery was that households were unable to recognize their impact in the waste management process. Noufal et al., (2021) mainly argued that community support and participation are important for waste management strategies to work. The households are a major stakeholder, which play a big role in reducing waste volume and increasing resource recovery. The participants suggested how members of the community can engage in a variety of activities to foster a greater sense of belonging (Nepal et al., 2022). The issue of community engagement is important for participative solid waste management. To use social capital in a way that helps both society and the environment, people need to be actively involved in their community (Tsai et al., 2020). Although utilising social capital is not a stand-alone solution to tackling waste issues, it can be extremely beneficial in the setting of Nigeria as well as other contexts with similar features. Hence, neglecting the usefulness of social currency might be costly in the long run (Vasconcelos et al., 2021). As an effective reliance on pre-existing indigenous networks can enhance mutual understanding in addressing solid waste environmental challenges. However, an alternate viewpoint posits that regulating social capital can be difficult. An inefficient use of social capital can obstruct the growth of new ideas that are seeking to challenge the conventional forms of solid waste management (Sotamenou et al., 2019). Consequently, the state and civic organisations must exercise prudence in engaging society in a trustworthy manner for solid waste management to be effectively co-created within the society.

As a result, the selected stakeholders in the solid waste management system appear to see the need for communicative engagement as a means of involving households in a more participatory waste management. Overall, communication seemingly plays an important role in achieving coproduction, but it should not be approached as a stand-alone option. Such an engagement is also important for waste management administration to effectively coproduce with household communities. In addition, adequate communicative engagement can enable efficient coproduction in the entrepreneurial or technological ventures of waste management systems in Lagos.

CHAPTER SIX: CONCLUSION

Conclusive Summary

The conclusion of the study is that an active household engagement by existing waste management systems is beneficial for sustainable waste management practices that society can identify with a greater sense of ownership. This study investigated the possibilities for coproduction in the management of solid waste with household communities in Lagos. The study also drew from existing research to emphasise the critical role of a collaborative integrated sustainable waste management approach for environmental, economic, and human development. However, primary data generated from interviewing stakeholders within the study area, outlined contextual issues that are relevant for a socially inclusive solid waste management system. While the application of thematic analysis technique indicated various patterns that emerged in the findings, the lens of coproduction aided in identifying, and framing the aspects for stakeholders' collaboration.

The empirical findings revealed issues that were described by waste management officers as well as private sector operators. Nevertheless, these issues seem to have direct implications for household participants. Activities like delayed waste evacuation or lobbying in the private sector seemed to result in waste being piled up in household communities. Similarly, the defaulting state of adequate legal enforcement negatively impacted waste management and sanitation in residential communities. Alongside the existing debates for sustainable waste management, households were observed to be lacking a reliable incentive for mutual accountability. They presented the need for recycling centres within household communities as it is currently inexistent in their neighbourhoods and can also serve as an avenue to reorient domestic waste practices. Collectively, these findings were analysed as key aspects for administration of waste governance in achieving coproduction.

The results also uncovered more resourceful discussions for collaborative waste management in Lagos, Nigeria. It appeared that stakeholders acknowledge enterprising benefits that can be harnessed through adequate waste management. The possibility for a greener economy seemed to be lacking adequate sensitisation within the findings. ICT was presented in the result as an avenue to promote engagement in waste management

activities. The results indicated contextual consideration and trust for adequate household engagement to be achieved through ICT. These issues were relevant for how state regulations were analysed in the aspect of entrepreneurship and technology for inclusive waste management.

Further findings from the study location were analytically discussed and identified as a relevant issue for communicative engagement in waste management. The result showed a conflicting debate for how information in waste operations seemed to be provided or inaccessible to household members. The findings also illustrated the significant role of awareness campaigns to enlighten household engagement in waste management practices. Additional findings in this regard seemed critical to passive forms of awareness and highlights the need for proactive sensitization. The result indicated the absence of adequate engagement and partnerships for collaborative waste management to be achieved within the community. Issues regarding a one-sided engagement of private actors, lack of adequate waste bins or environmental support groups seemed to have a negative impact on household engagement.

Therefore, a general finding within this report is that the concept of coproduction proved an effective framework for undertaking the current study. The inputs from various actors that engaged in the process of data collection did not seem to limit its application as a tool for framing the research findings. The analytical themes within the study indicated areas in which coproduction can be effectively explored to achieve the integration of household communities in solid waste management systems of Lagos. They include areas such as- administration of waste management, entrepreneurship & technology in waste management and communicative engagement.

Limitations of Study

However, due to the primary involvement with suburban household communities in Lagos, this study has some limitations. The current sample size within this report makes generalising the research's findings difficult. As a result, future studies that aim to conduct a similar type of research can use a larger sample size that may strengthen the generalizability of the current findings. More so, future research could attempt to include other participant groups like NGOs, state executives at the local or ministerial level.

Additionally, more research can be explored within other contexts that have different features from those similar to Lagos, Nigeria.

Furthermore, coproduction provided a guiding lens with which the results were deduced and interpreted. This implies that certain aspects of the finding were beyond the scope of the current study. However, these issues seem relevant for addressing collaboration in other areas of solid waste management. Therefore, future studies are recommended to explore; impact of COVID-19 on solid waste management systems, the role of manufacturing design for household reuse and recycle, influence of social media on public perceptions of solid waste, societal perceptions about sorting solid waste in Lagos, Nigeria. Finally, future studies can be done to understand the possible avenues to mitigate plastic waste pollution in Lagos, Nigeria.

Policy Recommendations

The study's findings were also intended to serve as a useful tool for policy recommendations. The evidence shows that solid waste management systems are not yet working as well as they could, especially in household communities. This poses a significant risk to the environment, endangers the daily lives of community members, and undermines the very purpose of establishing such systems in society. Overall, this study recommends that coproduction can be considered as a practical approach for policymakers in waste management systems to explore household participation.

This study was conducted through the aid of digital field work with three participant groups. They include household, PSP and LAWMA participants that were engaged through semi structured telephone interviews and provided rich primary data that informed the findings and analysis of the research. The data collection process also produced relevant suggestions that can contribute to policy issues within the household, PSP, LAWMA as well as the state. As a result, the following policy recommendations are presented in this study:

Recommendations For Household

The result suggested a reliance on support groups and environmental associations within the community. Stating that households can come together to share their observations and put up some consequences for defaulters. Furthermore, tenancy agreements were

mentioned in relation to neighbourhood rules that can govern domestic waste practices. Therefore, policy makers can formulate structures to explore this approach.

According to the data, cultural practices can be influential within households and more easily adopted into the larger society. The influential role of the community development associations was identified as a motivating figure to inspire local compliance. The data highlighted that the leadership in the CDA need to also be sensitised so they can transfer waste awareness to the community. Therefore, policy makers can ensure that traditional chiefs are carried along and enlightened about environmental pollution. This can enable them to communicate a similar awareness within their community.

Recommendations For PSP

The results revealed the issue of inadequate workforce within the private sector. Stating how delays in waste evacuation often encourages a dirty environment in household communities. This was a major discussion in the findings as the data indicated private sector concerns. However, the analysis addressed such an issue in the administration of waste management. Policy makers should ensure that adequate legal measures are taken into consideration to help address such issues. Nevertheless, private sector participants who are interested in handling waste management should also be diligent in the execution of their duties to the environment.

The issue of non-compliance in paying waste evacuation dues equally surfaced within the data. Another point that was mentioned is how waste charges can be regulated to encourage mass patronage. These were some of the issues on accountability in waste management within the results. It is also a relevant discussion in the findings of legal enforcement debates. Consequently, the analysis addressed this as key aspects for the administration of waste management. Therefore, policy makers should explore adequate measures to encourage compliance. Contextualised billing systems can encourage most willing households to installmentally bear the cost for waste evacuation.

The data uncovered that the waste disposal trucks used by the private sector was also an issue. Further stating the need for it to be properly covered so the waste does not spill over and end up in the drainages. The findings indicated this as private sector concerns that need to be addressed within the state. Therefore, the policy on administration of waste management should be reviewed to ensure hygienic evacuation as suggested in the

analysis section of this report. Such considerations are needed to include societal health in waste management operations.

Recommendations For LAWMA

According to the data, there is a need for proper channels to accommodate societal solid waste issues. Public complaints about compounding waste issues ought to be approached with more urgency. The results also indicated issues around legal enforcement debates and the need for accountability in waste management. This implies that waste management procedures need to be well structured to enhance adequate inclusion and encourage a progressive atmosphere within the state. Based on the analysis, this study suggests improved communicative engagement. This can also impact how adequate measures are to be decided upon for societal inclusion.

The results also uncovered that logistics needs to be accounted for on the PAKAM app. That there is a need for multiple collections to be done from various households sharing a common neighbourhood. Also, it was stated that this can increase the number of recyclables being registered and the accessibility for LAWMA officers to improve efficient waste recovery. However, the findings indicated conflicting informative debates as a possible limitation that can impede expert opinion. The manner of technological views in the findings also raises a bit of concern for such efficiency to be achieved. This study indicated through the analysis that such issues could be addressed through communicative engagements. Therefore, there is a need for policy makers to improve availability and accessibility of information in all aspects of waste management as well as the awareness regarding PAKAM.

As the findings indicated, there is a need to engage with societal realities while addressing the common issue of waste management. This point was indicated in various aspects of the result and here is the issue on technological views. While the use of the PAKAM app has struggled with engagement level as the data confirmed, ICT can be useful for raising more awareness. Policy makers need to take note of this observation within the results and address such ICT related issues in a more contextual approach. This can enable more adequate utilisation of such available means.

Recommendations For State

Policy reports for environment and waste management should aim to be clearly communicated to capture the reader's engagement in societies. This can help to eliminate issues of conflicting information debates as the results indicated.

Based on an analysis of the findings, the community is essential when thinking about climate policy for environmental issues. State policies were declared as crucial for how waste management can be contextually executed with other members in the community. This was analytically discussed within the aspect of communicative engagement. It can therefore be recommended that policy makers do not only adopt external institutional policy. However, efforts should be made to ensure that these policies are well adapted to address the contextual realities of the state.

According to the data, public enlightenment programmes can be organised to improve awareness about environmentally friendly practices. Waste officers agreed about the use of media to enlighten and engage society through mediums like TV & radio stations, social media, billboards, ads on disposal trucks, on “danfo” (commercial buses) or even animation aimed at the younger generation. Some participants mentioned the major role of governance in sensitization through information, communication, music and even entertainment industries. These are some of the key aspects recommended for policy makers to note, for diverse avenues for sensitization.

The results highlighted the role which schools, industries, businesses and other organisations can play in informing society about avenues for mitigating waste challenges. Policy makers are hereby recommended to approach such avenues as a means for building local capacity and ensuring that society is adequately being enlightened and included.

The participants reviewed communication as an issue in a mixed society of diverse academic waste backgrounds. They presented a complex reality that can benefit from the usage of local languages for environmental sensitization. Stating that indigenous languages like Yoruba, Igbo or Hausa can be resourceful for an attentive media audience. As a result, policymakers are encouraged to take these reports into consideration for broader forms of integration.

Based on the data, it was understood that environmental partnerships with private actors such as PSP should be offered within the views of public service standards. This was elaborated upon as the results indicated the need for more subsidised cost for waste disposal. Such an issue seems relevant to the administration of waste management within the analysis. Therefore, policy makers can explore this issue as a means to facilitate a widespread engagement of society in waste evacuation systems.

The data also stated that more trash bins are needed in the bus stations and even on the buses. The need for the state to install adequate waste disposal facilities seems key within the study location. This is also a relevant issue for the analysis on administration of waste management. Policy makers can play a vital role to ensure that the authority in waste management mandates the legal installation of waste disposal facilities.

Lagos is generally identified as a congested population as introduced in chapter one, the results confirmed that the state requires more recycling centres within the local government communities. According to the data, recycling was described as a tangible avenue to steer up motivation in society. It can provide practical demonstrations in waste management education. If recyclable products become more tangible in society, then people will be able to see for themselves and understand the importance of recycling as mentioned within the result. Policy makers can help to ensure recycling organisations are adequately strengthened to function within state laws.

The role of the state was severally mentioned for more enlightenment and engagement in household recycling. The results indicated that the local government needs to improve its relationships with the leaders in wards to ensure an organised domestic solid waste system. Such an issue seems relevant to the analysis based on communicative engagement. Policy makers could promote inclusion through community leaders as indicated within the findings.

Incentives like coupons or tokens can be offered within households that observe safe waste management practices. The data stated that this can be an effective measure for rewarding citizen participation in waste management. An effective policy legislation in this regard can ensure that such measures are adequately utilised.

The data highlighted the need for a waste management task force to enforce the rules to mitigate illegal dumping. Society should be enabled to see the implication of negative waste practices and they also need to be encouraged with incentives. The analysis

indicated that such an issue could be resolved through entrepreneurship and technology. It can also be perceived within the analysis on administration of waste management. Therefore, it can be relevant for policy makers to enact adequate laws based on these findings.

The results highlighted the issue of continued awareness that can be done for a couple of years. In the findings section, this was mentioned within the campaign for awareness and proactive sensitization. It was also relevant in the findings on enterprising waste concerns and technological views. Nevertheless, the analysis confirms that sensitization does not necessarily equal implementation. There is still a need for community engagement to be improved upon. Therefore, policy makers need to consider avenues to encourage innovation through waste enterprises. This is a proactive measure that can complement awareness raising within Lagos communities.

The results revealed the need for government systems to be more proactive and introduce mechanisms to address waste production before they become trash. The findings also indicated such issues within the need for community engagement and enterprising waste concerns in Lagos state, Nigeria. The analysis within entrepreneurship and technology suggested that waste can be reoriented as a resource. Policy makers are encouraged to explore possibilities for a green economy to thrive while utilising waste in this manner as a resource.

Finally, given the importance of solid waste management for sustainable development, the possibilities for coproduction with Lagos household communities have been discussed thus far. This study attempted to discuss the importance of involving both existing and new stakeholders within the specific scope of this report. This is to support a more inclusive system where no one is left behind in the pursuit of long-term human and environmental development. As a result, this study suggests that participatory governance with household communities can strengthen integrated sustainable waste management in Lagos, Nigeria. Although the inclusion of households is not presented as a complete solution to solid waste challenges, it can open new avenues for exploring coproduction in a more integrated solid waste management system.

REFERENCES

Adams, W.M., (2009). Green Development, Environment, and Sustainability in the Third World, 3rd Edition, Routledge, London.

Ade Ajayi J.F., & Reuben Kenrick Udo. (2019). Nigeria | Culture, History, & People. In Encyclopædia Britannica. https://www.britannica.com/place/Nigeria

Adekola, P. O., Iyalomhe, F. O., Paczoski, A., Abebe, S. T., Pawłowska, B., Bąk, M., & Cirella, G. T. (2021). Public perception and awareness of waste management from Benin City. *Scientific Reports*, *11*(1). https://doi.org/10.1038/s41598-020-79688-y

Akinbola, O. A., Ojo, O. A., & Hakeem, A. A. (2015). Role of Waste Management in Wealth Creation in Nigeria-Evidences From Lagos State Waste Management Authority (LAWMA). Ife PsychologIA, 23(1), 120–130

Al-Khateeb, A. J., Al-Sari, M. I., Al-Khatib, I. A., & Anayah, F. (2017). Factors affecting the sustainability of solid waste management system—the case of Palestine. Environmental Monitoring and Assessment, 189(2). https://doi.org/10.1007/s10661-017-5810-0

Alhassan, H., Asante, F. A., Oteng-Ababio, M., & Bawakyillenuo, S. (2018). Application of theory of planned behaviour to households' source separation behaviour in Ghana. *Management of Environmental Quality: An International Journal*, *29*(4), 704–721. https://doi.org/10.1108/MEQ-10-2017-0122

Almazán-Casali, S., Alfaro, J. F., & Sikra, S. (2019). Exploring household willingness to participate in solid waste collection services in Liberia. *Habitat International*, *84*, 57–64. https://doi.org/10.1016/j.habitatint.2019.01.001

Antwi-Agyei, P., Dwumfour-Asare, B., Adjei, K. A., Kweyu, R., & Simiyu, S. (2020). Understanding the barriers and opportunities for effective management of shared sanitation in low-income settlements—the case of kumasi, ghana. *International Journal of Environmental Research and Public Health*, *17*(12), 1–17. https://doi.org/10.3390/ijerph17124528

Aparcana, S. (2017). Approaches to formalization of the informal waste sector into municipal solid waste management systems in low- and middle-income countries: Review of barriers and success factors. In *Waste Management* (Vol. 61, pp. 593–607). Elsevier Ltd. https://doi.org/10.1016/j.wasman.2016.12.028

Bali Swain, R., & Yang-Wallentin, F. (2020). Achieving sustainable development goals: predicaments and strategies. International Journal of Sustainable Development and World Ecology, 27(2), 96–106. https://doi.org/10.1080/13504509.2019.1692316

Benach. (2021). We Must Take Advantage of This Pandemic to Make a Radical Social Change: The Coronavirus as a Global Health, Inequality, and Eco-Social Problem. International Journal of Health Services, 51(1), 50–54. https://doi.org/10.1177/0020731420946594

Boddy, D. (2016) Management: an introduction, 6th new edition, Pearson Education Ltd., UK.

Boulet, M., Hoek, A. C., & Raven, R. (2021). Towards a multi-level framework of household food waste and consumer behaviour: Untangling spaghetti soup. *Appetite*, *156*. https://doi.org/10.1016/j.appet.2020.104856

Bovaird, T. (2007). Beyond Engagement and Participation: User and Community Coproduction of Public Services. In *Source: Public Administration Review* (Vol. 67, Issue 5).

Britannica. (2019). Lagos | state, Nigeria. In The Editors of Encyclopaedia Britannica (Ed.), Encyclopædia Britannica. https://www.britannica.com/place/Lagos-state-Nigeria

Brown, D., & McGranahan, G. (2016). The urban informal economy, local inclusion and achieving a global green transformation. *Habitat International*, *53*, 97–105. https://doi.org/10.1016/j.habitatint.2015.11.002

Bryman, A. (2016) Social Research Methods: Fifth Edition, Oxford: Oxford University Press.

Buch, R., Marseille, A., Williams, M., Aggarwal, R., & Sharma, A. (2021). From waste pickers to producers: An inclusive circular economy solution through development

of cooperatives in waste management. *Sustainability (Switzerland)*, *13*(16). https://doi.org/10.3390/su13168925

Bui, T. D., Tsai, F. M., Tseng, M. L., & Ali, M. D. H. (2020). Identifying sustainable solid waste management barriers in practice using the fuzzy Delphi method. *Resources, Conservation and Recycling*, *154*. https://doi.org/10.1016/j.resconrec.2019.104625

Bulkeley, H., & Gregson, N. (2009). Crossing the threshold: Municipal waste policy and household waste generation. *Environment and Planning A*, *41*(4), 929–945. https://doi.org/10.1068/a40261

Cepiku, D., & Giordano, F. (2014). Co-Production in Developing Countries: Insights from the community health workers experience. *Public Management Review*, *16*(3), 317–340. https://doi.org/10.1080/14719037.2013.822535

Choon, S. W., Tan, S. H., & Chong, L. L. (2017). The perception of households about solid waste management issues in Malaysia. *Environment, Development and Sustainability*, *19*(5), 1685–1700. https://doi.org/10.1007/s10668-016-9821-8

Coker, A., Sangodoyin, A., Sridhar, M., Booth, C., Olomolaiye, P., & Hammond, F. (2009). Medical waste management in Ibadan, Nigeria: Obstacles and prospects. Waste Management, 29(2), 804–811. https://doi.org/10.1016/j.wasman.2008.06.040

Couth. (2011). Waste management activities and carbon emissions in Africa. Waste Management, 31(1), 131–137. https://doi.org/info:doi/

Das, S., Lee, S. H., Kumar, P., Kim, K. H., Lee, S. S., & Bhattacharya, S. S. (2019). Solid waste management: Scope and the challenge of sustainability. Journal of Cleaner Production, 228, 658–678. https://doi.org/10.1016/j.jclepro.2019.04.323

Dawodu, A., Oladejo, J., Tsiga, Z., Kanengoni, T., & Cheshmehzangi, A. (2021). Underutilization of waste as a resource: bottom-up approach to waste management and its energy implications in Lagos, Nigeria. *Intelligent Buildings International*. https://doi.org/10.1080/17508975.2021.1873097

De Feo, G., & de Gisi, S. (2010). Public opinion and awareness towards MSW and separate collection programmes: A sociological procedure for selecting areas and citizens

with a low level of knowledge. *Waste Management*, *30*(6), 958–976. https://doi.org/10.1016/j.wasman.2010.02.019

Diaz, R., & Otoma, S. (2014). Cost-benefit analysis of waste reduction in developing countries: A simulation. Journal of Material Cycles and Waste Management, 16(1), 108–114. https://doi.org/10.1007/s10163-013-0148-3

Ebekozien, A., Aigbavboa, C., Nwaole, A. N. C., Aginah, I. L., & Aigbedion, M. (2022). Sustainable cities through household waste management: an unexplored approach to challenges confronting private solid waste management. *Facilities*, *40*(5–6), 365–379. https://doi.org/10.1108/F-09-2021-0078

Ejigie, D. Abebaw. (2008). Determinants of Solid Waste Disposal Practices in Urban Areas of Ethiopia: A Household-Level Analysis. *Eastern Africa Social Science Research Review*, *24*(1), 1–14. https://doi.org/10.1353/eas.2008.0000

Everard, M., Reed, M. S., & Kenter, J. O. (2016). The ripple effect: Institutionalising pro-environmental values to shift societal norms and behaviours. *Ecosystem Services*, *21*, 230–240. https://doi.org/10.1016/j.ecoser.2016.08.001

Ezebilo, E. E. (2013). Willingness to pay for improved residential waste management in a developing country. *International Journal of Environmental Science and Technology*, *10*(3), 413–422. https://doi.org/10.1007/s13762-012-0171-2

Ezeudu, O. B., Oraelosi, T. C., Agunwamba, J. C., & Ugochukwu, U. C. (2021). *Co-production in solid waste management: analyses of emerging cases and implications for circular economy in Nigeria*. https://doi.org/10.1007/s11356-021-14471-8/Published

Fadhullah, W., Imran, N. I. N., Ismail, S. N. S., Jaafar, M. H., & Abdullah, H. (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. *BMC Public Health*, *22*(1). https://doi.org/10.1186/s12889-021-12274-7

Fernando, R. L. S. (2019). Solid waste management of local governments in the Western Province of Sri Lanka: An implementation analysis. *Waste Management*, *84*, 194–203. https://doi.org/10.1016/j.wasman.2018.11.030

Friedrich, & Trois, C. (2016). Current and future greenhouse gas (GHG) emissions from the management of municipal solid waste in the eThekwini Municipality – South Africa. Journal of Cleaner Production, 112, 4071–4083. https://doi.org/10.1016/j.jclepro.2015.05.118

Gahana Gopal, C., Patil, Y. B., K.T, S., & Prakash, A. (2018). Conceptual frameworks for the drivers and barriers of integrated sustainable solid waste management: A TISM approach. *Management of Environmental Quality: An International Journal*, *29*(3), 516–546. https://doi.org/10.1108/MEQ-10-2017-0117

Guardian Newspapers. (2018, May 24). Nigeria as the waste capital of Africa. The Guardian Nigeria News - Nigeria and World News. https://guardian.ng/opinion/nigeria-as-the-waste-capital-of-africa/

Guerrero, L. A., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. *Waste Management*, *33*(1), 220–232. https://doi.org/10.1016/j.wasman.2012.09.008

Gutberlet, J. (2015). More inclusive and cleaner cities with waste management co-production: Insights from participatory epistemologies and methods. *Habitat International*, *46*, 234–243. https://doi.org/10.1016/j.habitatint.2014.10.004

Gutberlet, J., Kain, J. H., Nyakinya, B., Oloko, M., Zapata, P., & Zapata Campos, M. J. (2017). Bridging Weak Links of Solid Waste Management in Informal Settlements. *Journal of Environment and Development*, *26*(1), 106–131. https://doi.org/10.1177/1070496516672263

Hyett, N., Kenny, A., & Dickson-Swift, V. (2014). Methodology or method? A critical review of qualitative case study reports. International journal of qualitative studies on health and well-being, 9(1), 23606.

Ife-Adediran, O. O. (2019). Elevated radiation fields from dumpsites in Lagos Nigeria–waste management concerns and the way forward. International Journal of Environmental Studies, 76(1), 52–65. https://doi.org/10.1080/00207233.2018.1494925

Ikhlayel, M. (2018). Development of management systems for sustainable municipal solid waste in developing countries: a systematic life cycle thinking approach. *Journal of Cleaner Production*, *180*, 571–586. https://doi.org/10.1016/j.jclepro.2018.01.057

Intergovernmental Panel on Climate Change. (2022, April 4). The evidence is clear: the time for action is now. We can halve emissions by 2030. — IPCC. IPCC. https://www.ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/

International Bank for Reconstruction. (2014). Public Disclosure Authorized Public Disclosure Authorized Public Disclosure Authorized Public Disclosure Authorized. https://documents1.worldbank.org/curated/en/221251487249039986/pdf/112871-WP-P130840-PUBLIC-v2-Abstract-sent-PSP-full-report-feb2017-web.pdf

Johansson, R. (2007). On Case Study Methodology. Open House International, 32(3), 48–54. https://doi.org/10.1108/ohi-03-2007-b0006

Kaplan Mintz, K., Henn, L., Park, J., & Kurman, J. (2019). What predicts household waste management behaviors? Culture and type of behavior as moderators. *Resources, Conservation and Recycling*, *145*, 11–18. https://doi.org/10.1016/j.resconrec.2019.01.045

Kehinde, O., Ramonu, O. J., Babaremu, K. O., & Justin, L. D. (2020). Plastic wastes: environmental hazard and instrument for wealth creation in Nigeria. In Heliyon (Vol. 6, Issue 10). Elsevier Ltd. https://doi.org/10.1016/j.heliyon.2020.e05131

Kollikkathara, N., Feng, H., & Stern, E. (2009). A purview of waste management evolution: Special emphasis on USA. In *Waste Management* (Vol. 29, Issue 2, pp. 974–985). https://doi.org/10.1016/j.wasman.2008.06.032

Kubanza, N. S., & Simatele, D. (2016). Social and environmental injustices in solid waste management in sub-Saharan Africa: a study of Kinshasa, the Democratic Republic of Congo. *Local Environment*, *21*(7), 866–882. https://doi.org/10.1080/13549839.2015.1038985

Kumar, A., Samadder, S. R., Kumar, N., & Singh, C. (2018). Estimation of the generation rate of different types of plastic wastes and possible revenue recovery from informal

recycling. *Waste Management*, *79*, 781–790. https://doi.org/10.1016/j.wasman.2018.08.045

Lagos State Government. (2022). About Lagos. Lagos State Government. https://lagosstate.gov.ng/about-lagos/

Lagos Waste Management Authority. (2021). LAWMA – Lagos Waste Management Authority (LAWMA). Lagos Waste Management Authority. https://lawma.gov.ng/

Laor, P., Suma, Y., Keawdounglek, V., Hongtong, A., Apidechkul, T., & Pasukphun, N. (2018). Knowledge, attitude and practice of municipal solid waste management among highland residents in Northern Thailand. *Journal of Health Research*, *32*(2), 123–131. https://doi.org/10.1108/JHR-01-2018-013

Lawanson, T. (2020, April 2). Lagos' size and slums will make stopping the spread of COVID-19 a tough task. The Conversation. https://theconversation.com/lagos-size-and-slums-will-make-stopping-the-spread-of-covid-19-a-tough-task-134723

Lawrence, K., Cooper, V., & Kissoon, P. (2020). Sustaining voluntary recycling programmes in a country transitioning to an integrated solid waste management system. *Journal of Environmental Management*, *257*. https://doi.org/10.1016/j.jenvman.2019.109966

Lim, S. Y., Lim, K. M., & Yoo, S. H. (2014). External benefits of waste-to-energy in Korea: A choice experiment study. In Renewable and Sustainable Energy Reviews (Vol. 34, pp. 588–595). Elsevier Ltd. https://doi.org/10.1016/j.rser.2014.03.045

Loeffler, E., & Bovaird, T. (2016). User and Community Co-Production of Public Services: What Does the Evidence Tell Us? *International Journal of Public Administration*, *39*(13), 1006–1019. https://doi.org/10.1080/01900692.2016.1250559

Lougheed, S. C., Metuzals, J., & Hird, M. J. (2018). Modes of governing Canadian waste management: a case study of Metro Vancouver's energy-from-waste controversy. *Journal of Environmental Policy and Planning*, *20*(2), 170–182. https://doi.org/10.1080/1523908X.2017.1343137

Ma, J., & Hipel, K. W. (2016). Exploring social dimensions of municipal solid waste management around the globe – A systematic literature review. *Waste Management*, *56*, 3–12. https://doi.org/10.1016/j.wasman.2016.06.041

Marsden, D. (1991). Indigenous management. In The tnternational Journal of Human Resouree Management (Vol. 2).

Marshall, R. E., & Farahbakhsh, K. (2013). Systems approaches to integrated solid waste management in developing countries. *Waste Management*, *33*(4), 988–1003. https://doi.org/10.1016/j.wasman.2012.12.023

Martin. (2015a, September 1). General Assembly hands over draft global sustainability agenda to UN Member States. United Nations Sustainable Development. https://www.un.org/sustainabledevelopment/blog/2015/09/general-assembly-hands-over-draft-global-sustainability-agenda-to-un-member-states/

Martin. (2015b, December 2). UN expert: Those who contributed least to climate change now fighting for survival. United Nations Sustainable Development. https://www.un.org/sustainabledevelopment/blog/2015/12/un-expert-those-who-contributed-least-to-climate-change-now-fighting-for-survival/

Massoud, M., Lameh, G., Bardus, M., & Alameddine, I. (2021). Determinants of Waste Management Practices and Willingness to Pay for Improving Waste Services in a Low-Middle Income Country. Environmental Management, 68(2), 198–209. https://doi.org/10.1007/s00267-021-01472-z

Meng, X., Tan, X., Wang, Y., Wen, Z., Tao, Y., & Qian, Y. (2019). Investigation on decision-making mechanism of residents' household solid waste classification and recycling behaviors. *Resources, Conservation and Recycling*, *140*, 224–234. https://doi.org/10.1016/j.resconrec.2018.09.021

Menikpura, S. N. M., Sang-Arun, J., & Bengtsson, M. (2013). Integrated Solid Waste Management: An approach for enhancing climate co-benefits through resource recovery. *Journal of Cleaner Production*, *58*, 34–42. https://doi.org/10.1016/j.jclepro.2013.03.012

Miner, K. J., Rampedi, I. T., Ifegbesan, A. P., & Machete, F. (2020). Survey on household awareness and willingness to participate in e-waste management in jos, plateau state, Nigeria. *Sustainability (Switzerland)*, *12*(3). https://doi.org/10.3390/su12031047

Modi, & Hanson, M. (2021). Health of women and children is central to covid-19 recovery. BMJ (Online), 373, n899–n899. https://doi.org/10.1136/bmj.n899

Nabatchi, T., Sancino, A., & Sicilia, M. (2017). Varieties of Participation in Public Services: The Who, When, and What of Coproduction. *Public Administration Review*, *77*(5), 766–776. https://doi.org/10.1111/puar.12765

Nepal, M., Karki Nepal, A., Khadayat, M. S., Rai, R. K., Shyamsundar, P., & Somanathan, E. (2022). Low-Cost Strategies to Improve Municipal Solid Waste Management in Developing Countries: Experimental Evidence from Nepal. *Environmental and Resource Economics*. https://doi.org/10.1007/s10640-021-00640-3

NNREC, (n.d.) The Norwegian National Research Ethics Committees: https://www.forskningsetikk.no/en/

Noufal, M., Maalla, Z., & Adipah, S. (2021). Households' participation in solid waste management system of Homs city, Syria. *GeoJournal*, *86*(3), 1441–1463. https://doi.org/10.1007/s10708-020-10139-x

Nzeadibe, T. C., & Ejike-Alieji, A. U. P. (2020). Solid waste management during Covid-19 pandemic: policy gaps and prospects for inclusive waste governance in Nigeria. In Local Environment (Vol. 25, Issue 7, pp. 527–535). Routledge. https://doi.org/10.1080/13549839.2020.1782357

Osborne, S. P., Radnor, Z., & Strokosch, K. (2016). Co-Production and the Co-Creation of Value in Public Services: A suitable case for treatment? *Public Management Review*, *18*(5), 639–653. https://doi.org/10.1080/14719037.2015.1111927

Ostrom, E. (1996). SO305-750X(96)00023-X Crossing the Great Divide: Coproduction, Synergy, and Development. In *World Development* (Vol. 24, Issue 6).

O'Reilly, K. (2011): Ethnographic Methods: Second Edition, London: Routledge.

Padilla, J., & Trujillo, J. C. (2018). Waste disposal and households' heterogeneity. Identifying factors shaping attitudes towards source-separated recycling in Bogotá, Colombia. Waste Management, 74, 16–33. https://doi.org/10.1016/j.wasman.2017.11.052

Petts, J. (2004). Barriers to participation and deliberation in risk decisions: Evidence from waste management. *Journal of Risk Research*, *7*(2), 115–133. https://doi.org/10.1080/1366987042000158695

Pires, A., Chang, N. bin, & Martinho, G. (2011). An AHP-based fuzzy interval TOPSIS assessment for sustainable expansion of the solid waste management system in Setúbal Peninsula, Portugal. *Resources, Conservation and Recycling*, *56*(1), 7–21. https://doi.org/10.1016/j.resconrec.2011.08.004

Population Stat. (2022). Lagos, Nigeria Population (2020) - Population Stat. Populationstat.com. https://populationstat.com/nigeria/lagos

Portugal-Pereira, J., & Lee, L. (2016). Economic and environmental benefits of waste-to-energy technologies for debris recovery in disaster-hit Northeast Japan. Journal of Cleaner Production, 112, 4419–4429. https://doi.org/10.1016/j.jclepro.2015.05.083

Raghu, S. J., & Rodrigues, L. L. R. (2020). Behavioral aspects of solid waste management: A systematic review. In *Journal of the Air and Waste Management Association* (Vol. 70, Issue 12, pp. 1268–1302). Bellwether Publishing, Ltd. https://doi.org/10.1080/10962247.2020.1823524

Rahji, & Oloruntoba, E. O. (2009). Determinants of households' willingness-to-pay for private solid waste management services in Ibadan, Nigeria. Waste Management & Research, 27(10), 961–965. https://doi.org/10.1177/0734242X09103824

Rathore, P., & Sarmah, S. P. (2020). Economic, environmental and social optimization of solid waste management in the context of circular economy. *Computers and Industrial Engineering*, *145*. https://doi.org/10.1016/j.cie.2020.106510

Raven, R., Reynolds, D., Lane, R., Lindsay, J., Kronsell, A., & Arunachalam, D. (2021). Households in sustainability transitions: a systematic review and new research

avenues. *Environmental Innovation and Societal Transitions*, *40*, 87–107. https://doi.org/10.1016/j.eist.2021.06.005

Reid, L., Sutton, P., & Hunter, C. (2010). Theorizing the meso level: The household as a crucible of pro-environmental behaviour. *Progress in Human Geography*, *34*(3), 309–327. https://doi.org/10.1177/0309132509346994

Reuben Kenrick Udo, & Falola, T. O. (2019). Nigeria - Nigeria as a colony. In Encyclopædia Britannica. https://www.britannica.com/place/Nigeria/Nigeria-as-a-colony

Russel, K., Tilmans, S., Kramer, S., Sklar, R., Tillias, D., & Davis, J. (2015). User perceptions of and willingness to pay for household container-based sanitation services: experience from Cap Haitien, Haiti. *Environment and Urbanization*, *27*(2), 525–540. https://doi.org/10.1177/0956247815596522

Sarbassov, Y., Sagalova, T., Tursunov, O., Venetis, C., Xenarios, S., & Inglezakis, V. (2019). Survey on household solid waste sorting at source in developing economies: A case study of Nur-Sultan City in Kazakhstan. *Sustainability (Switzerland)*, *11*(22). https://doi.org/10.3390/su11226496

Seadon, J. K. (2010). Sustainable waste management systems. *Journal of Cleaner Production*, *18*(16–17), 1639–1651. https://doi.org/10.1016/j.jclepro.2010.07.009

Serge Kubanza, N. (2021). The role of community participation in solid waste management in Sub-Saharan Africa: a study of Orlando East, Johannesburg, South Africa. *South African Geographical Journal*, *103*(2), 223–236. https://doi.org/10.1080/03736245.2020.1727772

Serge Kubanza, N., Matsika, R., & Magha, C. G. (2022). Exploring the role of local authorities and community participation in solid waste management in sub-saharan Africa: a study of Alexandra, Johannesburg, South Africa. *Local Environment*, *27*(2), 197–214. https://doi.org/10.1080/13549839.2021.2010186

Shekdar, A. v. (2009). Sustainable solid waste management: An integrated approach for Asian countries. *Waste Management*, *29*(4), 1438–1448. https://doi.org/10.1016/j.wasman.2008.08.025

Shen, L., Si, H., Yu, L., & Si, H. (2019). Factors influencing young people's intention toward municipal solid waste sorting. *International Journal of Environmental Research and Public Health*, *16*(10). https://doi.org/10.3390/ijerph16101708

Sholanke, D., & Gutberlet, J. (2022). Call for participatory waste governance: waste management with informal recyclers in Vancouver. *Journal of Environmental Policy and Planning*, *24*(1), 94–108. https://doi.org/10.1080/1523908X.2021.1956308

Simiyu, S. N., Kweyu, R. M., Antwi-Agyei, P., & Adjei, K. A. (2020). Barriers and opportunities for cleanliness of shared sanitation facilities in low-income settlements in Kenya. *BMC Public Health*, *20*(1). https://doi.org/10.1186/s12889-020-09768-1

Singh, J., & Ordoñez, I. (2016). Resource recovery from post-consumer waste: important lessons for the upcoming circular economy. *Journal of Cleaner Production*, *134*, 342–353. https://doi.org/10.1016/j.jclepro.2015.12.020

Sorrentino, M., Sicilia, M., & Howlett, M. (2018). Understanding co-production as a new public governance tool. *Policy and Society*, *37*(3), 277–293. https://doi.org/10.1080/14494035.2018.1521676

Sotamenou, J., de Jaeger, S., & Rousseau, S. (2019). Drivers of legal and illegal solid waste disposal in the Global South - The case of households in Yaoundé (Cameroon). *Journal of Environmental Management*, *240*, 321–330. https://doi.org/10.1016/j.jenvman.2019.03.098

Spuhler, D., Germann, V., Kassa, K., Ketema, A. A., Sherpa, A. M., Sherpa, M. G., Maurer, M., Lüthi, C., & Langergraber, G. (2020). Developing sanitation planning options: A tool for systematic consideration of novel technologies and systems. *Journal of Environmental Management*, *271*. https://doi.org/10.1016/j.jenvman.2020.111004

Steen, T., Nabatchi, T., & Brand, D. (2016). Introduction: Special issue on the coproduction of public services. In *International Review of Administrative Sciences* (Vol. 82, Issue 1, pp. 3–7). SAGE Publications Ltd. https://doi.org/10.1177/0020852315618187

Sundaravadivel, M., & Vigneswaran, S. (2003). *Strategies for waste management in small and medium towns of developing countries: a case study of India*.

Sung, K., Cooper, T., & Kettley, S. (2019). Factors influencing upcycling for UK makers. *Sustainability (Switzerland)*, *11*(3). https://doi.org/10.3390/su11030870

The world bank. (2022, February 11). Solid Waste Management. World Bank. https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management

Tonglet, M., Phillips, P. S., & Read, A. D. (2004). Using the Theory of Planned Behaviour to investigate the determinants of recycling behaviour: A case study from Brixworth, UK. *Resources, Conservation and Recycling*, *41*(3), 191–214. https://doi.org/10.1016/j.resconrec.2003.11.001

Trischler, J., Svensson, P. O., Williams, H., & Wikström, F. (2022). Citizens as an innovation source in sustainability transitions – linking the directionality of innovations with the locus of the problem in transformative innovation policy. *Public Management Review*, 1–23. https://doi.org/10.1080/14719037.2022.2062041

Tsai, F. M., Bui, T. D., Tseng, M. L., Lim, M. K., & Hu, J. (2020). Municipal solid waste management in a circular economy: A data-driven bibliometric analysis. *Journal of Cleaner Production*, *275*. https://doi.org/10.1016/j.jclepro.2020.124132

Turcott Cervantes, D. E., López Martínez, A., Cuartas Hernández, M., & Lobo García de Cortázar, A. (2018). Using indicators as a tool to evaluate municipal solid waste management: A critical review. In *Waste Management* (Vol. 80, pp. 51–63). Elsevier Ltd. https://doi.org/10.1016/j.wasman.2018.08.046

UN. (2020). INEQUALITY IN A RAPIDLY CHANGING WORLD. https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/01/World-Social-Report-2020-FullReport.pdf

UN-Habitat. (n.d.). Waste Management | UN-Habitat. Unhabitat.org. https://unhabitat.org/topic/waste-management

UNEP. (2015). Global Waste Management Outlook. https://wedocs.unep.org/bitstream/handle/20.500.11822/9672/-Global_Waste_Management_Outlook-2015Global_Waste_Management_Outlook.pdf.pdf?sequence=3&%3BisAllowed=

UNEP. (2017, September 26). Solid waste management. UNEP - UN Environment Programme. https://www.unep.org/explore-topics/resource-efficiency/what-we-do/cities/solid-waste-management

UNEP. (2018, January 16). Sustainable waste management is an opportunity, not burden - Head of UN Environment's Almaty Office. UN Environment. https://www.unep.org/news-and-stories/news/sustainable-waste-management-opportunity-not-burden-head-un-environments

UNEP. (2020). Waste management an essential public service in the fight to beat COVID-19. UNEP - UN Environment Programme. https://www.unenvironment.org/news-and-stories/press-release/waste-management-essential-public-service-fight-beat-covid-19

United Nations. (2012, November 6). Links between waste management and environmental sustainability spotlighted at UN-backed conference. UN News. https://news.un.org/en/story/2012/11/424932-links-between-waste-management-and-environmental-sustainability-spotlighted-un

United Nations. (2019). The future is now science for achieving sustainable development; Global sustainable development report 2019. http://pure.iiasa.ac.at/id/eprint/16067/1/24797GSDR_report_2019.pdf

United Nations Statistics Division. (2015). UNSD — Demographic and Social Statistics. Un.org. https://unstats.un.org/unsd/demographic-social/census/

United Nations. (n.d.). Department of Economic and Social Affairs. statistics. SDG indicators database. Unstats.un.org. https://unstats.un.org/sdgs/dataportal/countryprofiles/nga#goal-1

University of Agder (n.d.). Code of practice for processing personal data in research and students' dissertations. Retrieved from: https://www.uia.no/en/research/about-the-research/code-of-practice-for-processing-personal-data-in-research-and-students-dissertations

Uzochukwu, K., & Thomas, J. C. (2018). Who Engages in the Coproduction of Local Public Services and Why? The Case of Atlanta, Georgia. *Public Administration Review*, *78*(4), 514–526. https://doi.org/10.1111/puar.12893

Vaccari, M., Bella, V. di, Vitali, F., & Collivignarelli, C. (2013). From mixed to separate collection of solid waste: Benefits for the town of Zavidovići (Bosnia and Herzegovina). Waste Management, 33(2), 277–286. https://doi.org/10.1016/j.wasman.2012.09.012

Van den Broek, K. L. (2019). Stakeholders' perceptions of the socio-economic and environmental challenges at Lake Victoria. *Lakes and Reservoirs: Research and Management*, *24*(3), 239–245. https://doi.org/10.1111/lre.12275

Van De Klundert, A., & Anschütz, J. (2001). Integrated Sustainable Waste Management -the Concept Tools for Decision-makers Experiences from the Urban Waste Expertise Programme (1995-2001). https://www.ircwash.org/sites/default/files/Klundert-2001-Integrated.pdf

Van Leeuwen, K., de Vries, E., Koop, S., & Roest, K. (2018). The Energy & Raw Materials Factory: Role and Potential Contribution to the Circular Economy of the Netherlands. *Environmental Management*, *61*(5), 786–795. https://doi.org/10.1007/s00267-018-0995-8

Van Welie, M. J., & Romijn, H. A. (2018). NGOs fostering transitions towards sustainable urban sanitation in low-income countries: Insights from Transition Management and Development Studies. *Environmental Science and Policy*, *84*, 250–260. https://doi.org/10.1016/j.envsci.2017.08.011

Vanhuyse, F., Fejzić, E., Ddiba, D., & Henrysson, M. (2021). The lack of social impact considerations in transitioning towards urban circular economies: a scoping review. *Sustainable Cities and Society*, *75*. https://doi.org/10.1016/j.scs.2021.103394

Vanguard News Nigeria. (2021, April 29). Lagos generates 14,000 metric tonnes waste daily — Commissioner. Vanguard News. https://www.vanguardngr.com/2021/04/lagos-generates-14000-metric-tonnes-waste-daily-commissioner/

Vasconcelos, L. T., Silva, F. Z., Ferreira, F. G., Martinho, G., Pires, A., & Ferreira, J. C. (2021). Collaborative process design for waste management: co-constructing strategies with stakeholders. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-021-01822-1

Vitorino de Souza Melaré, A., Montenegro González, S., Faceli, K., & Casadei, V. (2017). Technologies and decision support systems to aid solid-waste management: a systematic review. In *Waste Management* (Vol. 59, pp. 567–584). Elsevier Ltd. https://doi.org/10.1016/j.wasman.2016.10.045

Vollan, B., & Ostrom, E. (2010). Cooperation and the Commons. *Source: Science*, *330*(6006), 923–924. https://doi.org/10.1126/science.ll98347

Vučijak, B., Kurtagić, S. M., & Silajdžić, I. (2016). Multicriteria decision making in selecting best solid waste management scenario: A municipal case study from Bosnia and Herzegovina. *Journal of Cleaner Production*, *130*, 166–174. https://doi.org/10.1016/j.jclepro.2015.11.030

Wadehra, S., & Mishra, A. (2018). Encouraging urban households to segregate the waste they generate: Insights from a field experiment in Delhi, India. *Resources, Conservation and Recycling*, *134*, 239–247. https://doi.org/10.1016/j.resconrec.2018.03.013

Wang, H., Liu, X., Wang, N., Zhang, K., Wang, F., Zhang, S., Wang, R., Zheng, P., & Matsushita, M. (2020). Key factors influencing public awareness of household solid waste recycling in urban areas of China: A case study. *Resources, Conservation and Recycling*, *158*. https://doi.org/10.1016/j.resconrec.2020.104813

Watson, V. (2014). Co-production and collaboration in planning - The difference. Planning Theory and Practice, 15(1), 62–76. https://doi.org/10.1080/14649357.2013.866266

Weng, Y. C., & Fujiwara, T. (2011). Examining the effectiveness of municipal solid waste management systems: An integrated cost-benefit analysis perspective with a financial cost modeling in Taiwan. *Waste Management*, *31*(6), 1393–1406. https://doi.org/10.1016/j.wasman.2011.01.016

West, P. (2016). Critical political ecology [YouTube Video]. In YouTube. https://www.youtube.com/watch?v=SAWfggb1ezw

Whitaker, G. P. (1980). Coproduction: Citizen Participation in Service Delivery. In *Source: Public Administration Review* (Vol. 40, Issue 3).

Wiewiora, A., Keast, R., & Brown, K. (2016). Opportunities and Challenges in Engaging Citizens in the Co-Production of Infrastructure-Based Public Services in Australia. *Public Management Review*, *18*(4), 483–507. https://doi.org/10.1080/14719037.2014.999820

Wilson, D. C., Rodic, L., Cowing, M. J., Velis, C. A., Whiteman, A. D., Scheinberg, A., Vilches, R., Masterson, D., Stretz, J., & Oelz, B. (2015). "Wasteaware" benchmark indicators for integrated sustainable waste management in cities. *Waste Management*, *35*, 329–342. https://doi.org/10.1016/j.wasman.2014.10.006

Wilson, D. C., Velis, C. A., & Rodic, L. (2013). Integrated sustainable waste management in developing countries. Proceedings of the Institution of Civil Engineers - Waste and Resource Management, 166(2), 52–68. https://doi.org/10.1680/warm.12.00005

World Health Organization, & the United Nations Children's Fund. (2020). Water, sanitation, hygiene and waste management for COVID-19. Www.who.int. https://www.who.int/publications-detail/water-sanitation-hygiene-and-waste-management-for-covid-19

World Population Review. (2021). Lagos Population 2020 (Demographics, Maps, Graphs). Worldpopulationreview.com. https://worldpopulationreview.com/world-cities/lagos-population

Xu, C. K., & Tang, T. (2020). Closing the Gap or Widening the Divide: The Impacts of Technology-Enabled Coproduction on Equity in Public Service Delivery. *Public Administration Review*, *80*(6), 962–975. https://doi.org/10.1111/puar.13222

Zhang, Y., Wang, G., Zhang, Q., Ji, Y., & Xu, H. (2022). What determines urban household intention and behavior of solid waste separation? A case study in China. *Environmental Impact Assessment Review*, *93*. https://doi.org/10.1016/j.eiar.2021.106728

Zhou, J., Jiang, P., Yang, J., & Liu, X. (2021). Designing a smart incentive-based recycling system for household recyclable waste. *Waste Management*, *123*, 142–153. https://doi.org/10.1016/j.wasman.2021.01.030

Zorpas, A. A. (2020). Strategy development in the framework of waste management. *Science of the Total Environment*, *716*. https://doi.org/10.1016/j.scitotenv.2020.137088

Zotos, G., Karagiannidis, A., Zampetoglou, S., Malamakis, A., Antonopoulos, I. S., Kontogianni, S., & Tchobanoglous, G. (2009). Developing a holistic strategy for integrated waste management within municipal planning: Challenges, policies, solutions and perspectives for Hellenic municipalities in the zero-waste, low-cost direction. *Waste Management*, *29*(5), 1686–1692. https://doi.org/10.1016/j.wasman.2008.11.016

Zurbrügg, C., Gfrerer, M., Ashadi, H., Brenner, W., & Küper, D. (2012). Determinants of sustainability in solid waste management - The Gianyar Waste Recovery Project in Indonesia. *Waste Management*, *32*(11), 2126–2133. https://doi.org/10.1016/j.wasman.2012.01.011