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AN ASSESSMENT OF SOLID WASTE MANAGEMENT IN LINGWALA, KINSHASA, DEMOCRATIC REPUBLIC OF THE CONGO

BY

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Abstract

This research assessed the solid waste management policy in Lingwala Municipality, Kinshasa, the Democratic Republic of the Congo (DRC). The main objective of this research was to assess the effectiveness of the existing solid waste management strategies and identify challenges affecting their implementation. The research was conducted in Lingwala Township. This study adopted a qualitative research approach. Data were collected from 60 respondents through questionnaires. Purposive and convenience sampling techniques were used to select participants from the study area. The study contributes to providing information for decision making since the management of solid waste play an important role in the daily life of the Congolese people. The study aims to find failures in the implementation of the policy in order to give recommendations of how it may be improved for the wellbeing of both the government and the stakeholders, but also to find successes in the implementation in case the government decides to modify the existing policy. The findings revealed that residential areas are the major sources of solid waste in Lingwala. The study also found that waste collection is irregular, with most waste being collected once a month, which contributes to environmental and public health risks. Furthermore, the results indicated inadequate infrastructure, insufficient municipal vehicles, lack of waste separation practices, and poor enforcement of waste management regulations. Institutional challenges such as limited financial resources, lack of technical capacity, weak stakeholder coordination, and low public awareness were also identified as major barriers to effective policy implementation. The study concluded that although solid waste management policies exist, their implementation remains inadequate in Lingwala Municipality. The gap between policy formulation and execution has led to inefficient waste collection, poor disposal practices, and environmental degradation. The research recommends strengthening policy enforcement, improving waste collection systems, promoting waste separation at source, increasing public awareness, and enhancing collaboration between government, private sector, and community-based organizations. These measures would contribute to sustainable solid waste management and improved environmental health in Lingwala Municipality.

Keywords: Local government, Solid waste management, waste disposal, awareness, Lingwala, Democratic Republic of the Congo

Declaration

I declare that this dissertation is my original work except where sources have been acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

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Dedication

I dedicate this work to my Lord and Savior Jesus Christ who I return to all the Glory and Honor, to my parents Jacques Okito and Lola Yema for their unending support. To my entire family for the encouragement and support throughout the course of my studies. Thank you for your support spiritually and encouragements during this time of my academic work.

List of Acronyms and Abbreviations

DRC	Democratic Republic of the Congo
SWM	Solid Waste Management
MSWM	Municipal Solid Waste Management
PAR	Participatory Action Research
NGOs	Non-Governmental Organizations
UNEP	United Nations Environment Programme
UN	United Nations
FAO	Food and Agriculture Organization
EMA	Environmental Management Agency
EMCA	Environmental Management and Coordination Act
ESIA	Environmental and Social Impact Assessment
NEMA	National Environment Management Authority
CDF	Congolese Franc
PPP	Public-Private Partnership
CBOs	Community-Based Organizations

Definition of Key Terms

Municipal Solid Waste (MSW): Refers to everyday items discarded by households, businesses, and institutions, including food waste, plastics, paper, metals, and other non-hazardous waste materials (Tchobanoglous, Theisen, & Vigil, 1993).

Solid Waste Management (SWM): The collection, transportation, processing, recycling, and disposal of solid waste in a way that minimizes its impact on human health and the environment (Kombe, 1997).

Policy Implementation: The process of putting government rules, regulations, and strategies into action to achieve intended outcomes (Okoroma, 2006).

Participatory Action Research (PAR): A research approach that actively involves local communities in the research process to address issues affecting them and to generate practical solutions (Chambers, 1990).

Purposive Sampling: A non-probability sampling method where the researcher selects participants based on their knowledge or experience relevant to the research topic (Alchemer, 2021).

Convenience Sampling: A non-probability sampling method in which participants are selected because they are readily available and accessible to the researcher (Dudovskiy, 2012).

Biodegradable Waste: Organic waste that can naturally decompose through the action of microorganisms, such as food scraps, leaves, and garden waste (Tchobanoglous et al., 1993).

Non-Biodegradable Waste: Waste materials that do not decompose naturally, including plastics, metals, and glass, which require specific disposal or recycling methods (Kombe, 1997).

Curbside Collection: A system where waste is collected from households or businesses at the edge of the street, typically by municipal or private waste management services (Ayres, 2016).

Circular Economy: An economic system aimed at minimizing waste and making the most of resources by recycling, reusing, and recovering materials rather than disposing of them (Ellen MacArthur Foundation, 2015).

Linear Flow System: A traditional waste management system in which resources are used and disposed of without reusing or recycling, often resulting in environmental degradation (Ayres, 2016).

Environmental Management Agency (EMA): In Zimbabwe, EMA is the government agency responsible for monitoring, controlling, and managing environmental resources and pollution (EMA, 2020).

Recycling Incentives: Programs or policies designed to encourage individuals and organizations to return waste materials for reuse or processing into new products (UNEP, 2023).

Waste Hierarchy: A framework prioritizing waste management strategies in order of environmental preference, typically: reduce, reuse, recycle, recover, and dispose (UNEP, 2023).

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CHAPTER 1 INTRODUCTION

1.1 Introduction

The focus of this study is on solid waste management in Lingwala, Kinshasa (DRC). This introductory chapter gives the background to the study, which focuses on the problem of household waste in the World, Africa, and the Democratic Republic of the Congo (DRC) in particular. It also gives, in short, the management policy of DRC. The chapter will provide and cover the background of the study, the statement of the problem, purpose and significance of the study, the research assumptions, objectives, the research questions, delimitation, limitations and definition of the key terms of the study as well as summary of the study.

1.2 Background to the Study

Solid wastes are undesired materials that are thrown or disposed of as unwanted material (Leblanc, 2018), whereas Solid Waste Management is the management of this refuse that is disposed into the environment as a by-product of human activity. Solid waste management is frequently connected with the management, storage, collection, and processing of rubbish materials in accordance with desired conservation, economics, public health, and other environmental considerations (Rahmaddin et al., 2015). According to the World Bank, the waste generation will increase to 3.40 billion tons of waste by the year 2050 (World Bank, 2019); where there is an estimate of 2.01 billion tons of wastes that countries produced per year as of 2016 which amounts to a footprint of 0.74 kilograms per person in a single day. The lack of improved and adequate infrastructures, poor implementation of existing environmental sanitation laws, unplanned disposal of solid wastes, urban growth due to rural-urban migration, and insufficient

capital to run solid waste management processes and adopt new forms of technology that support waste disposal are the major causes of improper solid waste disposal in urban areas (Momodu 2011). Over the years, there has been rapid industrialization, urbanization, and an explosive rise of the human population, and all of that have been directly related to trash generation and exacerbated waste management challenges particularly in developing nations (EMA, 2015). However, local governments face many challenges when it comes to properly managing their solid waste. As a result, it is estimated that at least 94,635 of people live in areas that lack waste collection and rely on uncontrolled dumpsites (UNEP and ISWA 2015). Inadequate solid waste management systems present serious risks to human health, the environment, and livelihoods in many cities.

Solid waste disposal that is thoughtless is a serious threat to the environment and the health of the people who live in it. (Ejaz, Hashmi & Naeem, 2010; Neller 2015). Inadequate solid waste collection and disposal leads to the multiplication of pathogenic microorganisms that cause the diseases like cholera and diarrhea, as well as a convenient breeding site for parasites, viruses, and bacteria that cause vector-borne diseases like malaria which are transmitted by mosquitoes (Kassim and Ali 2006; Abul 2010). The management of waste is needed to decrease or mitigate the growing worldwide crisis on the accumulation of solid wastes which pollutes the environment, endangers humanity, and damages the communities (World Bank, 2019). It is clear that if nothing is done now, irrevocable changes to the ecosystem would occur and affecting the quality of land, air, and water in our environments. The delay in implementing this initiative may increase or multiply the costs of reversing or minimizing the damage, and if these costs are ignored due to the poor economic conditions, the land and water quality will continue to deteriorate, increasing

the susceptibility of the communities to contract fatal diseases that may cost the lives and social well-being.

African countries have experienced strong rates of population growth in recent years, as a result of increased rural-urban mobility, industrialization, and urbanization, as well as advances in the production processes and living conditions (Chimuka and Ogola 2015; Mohee and Simelane 2015). These variations have been accompanied by and increased environmental challenges among that include amplified solid waste generation. Other developing countries have been affected greatly by rapid urban population growth particularly during the nineteenth century, causing unprecedented demands on cities to provide waste management services such as waste collection (Simelane 2015). The lack of financial resources, policy framework, and weak institutional have unfortunately made it difficult for the local authorities to effectively manage the solid waste (Simatele, Dlamini, and Kubanza 2017).

In many sub-Saharan African countries, there is an increase in the demand for urban services due to augmented rates of urbanization driven largely by rural-urban migration. In most suburbs of African cities, the supply of basic services such as social-economic, waste removal, and clean piped water supply has largely not kept pace with the increasing demand for the urban services (Nyenje, 2011). This situation has been a result of a number of factors which include weak institutional frameworks, lack of skilled labor which has impacted on urban governance, and economic deteriorations. The uncollected and usually illegally dumped solid waste is now increasingly becoming a disaster for human health and environmental degradation especially in poor and marginalized areas of these cities (Okot-Okumu and Nyenje, 2011).

It is important to note that the solid waste problem in Lingwala, Kinshasa has been made worse by the increase in the urban population. The population has increased from 49,173 in the 1990s to more than 94,635 people in 2004 and it is now estimated to have reached 10 million in 2010 (Nsokimieno, 2010). Despite the civil war that has ravaged the country and many lives in the DRC, there has been a concerted effort by the government to include environmental issues and natural resource management in development and planning policies. However, this is one of the view that environmental provisions within the national development policies and constitution have been incorporated with different motivations and largely revolve around benefiting selected powerful political and economic actors. As a result, a fundamental concern with regard to environmental management in Kinshasa and the country DRC as a whole revolves around the complexity of the implementation and enforcement of the environmental legislation that if appropriately implemented can contribute to unpacking the balance of all interested parties and contribute to promoting an urban environment in which all the needs of all urban residents including the poor are met (Kihangi, 2012).

In addition to biological and plastic waste, a particular feature of the solid waste challenge in Lingwala, Kinshasa is imported second-hand goods: where old computers and other technologies associated materials from the developed north, and which normally end up being dumped within city spaces, if not used or sold (Lateef et al., 2010). If not collected and managed properly, these materials are not only become a health hazard but end up blocking most of the anaerobic canals and waterways leading to recurrent flood episodes. According to Din and Cohen, (2013) and supported by Lateef et al., (2010), the city is increasingly becoming a city that is overcrowded with solid waste and this situation poses

a number of risks which include fire and health hazards, especially for children playing on or near waste dumps (Hardoy et al., 1992). Thus, children from poor households in Lingwala are considered the most at risk to waste that has not been disposed of in a safe and scientific manner. Other high-risk groups include waste workers, and workers in facilities producing toxic and infectious material to population living close to a waste dump, and those whose water supply has become contaminated either due to waste dumping or leakage from landfill sites. Uncollected solid waste also increases the risk of injury, and infection particularly for poor households who oftentimes burn their waste as a common practice of waste disposal. This is because these households have the least adequate garbage collection services (Nsokimieno, 2010).

The solid waste management challenge in Lingwala is not only a question of the scale of population growth but also the weaknesses and deficiencies in both national and local government institutions in the face of rapid urban change. Longondjo, (2010) observes that at the city level, a lack of resources and knowledge prevent not only people from solving their solid waste problems; but also institutions from managing change in a much more coordinated manner. Institutions that are mandated with urban management in Lingwala usually do not coordinate their activities because urban governance has been developed as a system of procedures imposed from above. Din and Cohen, (2013) observe that there is a multiplicity of agencies that may deliver urban services, but there is no coordination among them.

A research study on the attitudes of students and the behavior towards solid waste management at the University of Kebangsaan Malaysia, Bangi Campus, highlighted that the behavioral level and perceptions of people concerning solid waste management

programs are critical in finding solutions to waste management (Desa, Kadir & Yusooff, 2012). If the necessary instruments are not available, then the indiscriminate solid waste disposal will continue to pose a serious threat to the environment. Waste management that is not done properly can have major health consequences for those who live in the area.

The purpose of this research study consists in highlighting or developing the policies and practices being implemented by the DRC government and the people in order to ascertain possible effective ways to correctly manage solid wastes that can reduce environmental pollution.

1.3 Statement of the Problem

The Democratic Republic of the Congo has signed international agreements like the Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal, with intention to uphold the principles of sustainable development and environmental protection and as the country gazette its waste management policy called Kinshasa city Solid Waste Management Policy 2018 with the aim of addressing the city's significant waste management challenges. The policy's focus was to improve waste collection, disposal, and treatment infrastructure as well as promoting awareness and education among residents. However, inadequate infrastructure, poor policy implementation, and a lack of understanding among stakeholders are the main problems facing Kinshasa, Democratic Republic of the Congo's solid waste management system has resulted in environmental degradation, health risks, and ineffective waste disposal practices. Inadequate infrastructure for waste collection, disposal, and treatment characterizes Kinshasa's current solid waste management system, which leads to widespread littering, open dumping, and uncontrolled waste burning that endangers

community health, contaminates water sources, and accelerates climate change. Additionally, ineffective waste segregation and recycling procedures result in the loss of important resources and chances for economic growth. The situation is made worse by Kinshasa's fast urbanization and population increase, which puts tremendous strain on the city's waste management infrastructure. This underscores the necessity of a thorough evaluation and revision of the current framework for solid waste management policy. Effective solid waste management techniques that put environmental sustainability, public health, and economic development first are desperately needed, as highlighted by the African Union's Agenda 2063 and the United Nations' Sustainable Development Goals (SDGs), especially Goals 11 (Sustainable Cities and Communities) and 12 (Responsible Consumption and Production). Thus, this study aims to evaluate Kinshasa's solid waste management policy framework, pinpoint weaknesses and obstacles, and suggest changes that would enhance waste management procedures, advance sustainable development, and safeguard the environment and public health.

1.4 Research Objectives

The specific objectives of the research are to:

1. To identify the strategies of solid waste management in Lingwala, Kinshasa
2. To explore the effectiveness of solid waste management strategies in Lingwala, Kinshasa
3. To examine the challenges affecting the implementation of solid waste management strategies in Lingwala, Kinshasa
4. To suggest policies to ensure proper solid waste management in Lingwala, Kinshasa

1.5 Research Questions

1. What are the strategies of solid waste management in Lingwala, Kinshasa?
2. What is the effectiveness of solid waste management strategies in Lingwala, Kinshasa?
3. What challenges affect the implementation of solid waste management in Lingwala, Kinsaha?
4. What are the policies to ensure proper solid waste management in Lingwala, Kinshasa?

1.6 Purpose of Research

The research aims to assess the effectiveness of the current policy on solid waste management in the Democratic Republic of Congo, since its implementation in 2002. The study contributes to providing information on the progress of the policy since the management of solid waste are an important role in the daily lives of the Congolese population. The study aims to find failures in the implementation of the policy in order to give recommendations and strategies of how it may be improved for the well-being of both the government and the stakeholders; but also, to find successes in the implementation in case the government decides to modify the policy. The study will be contributed to raising the awareness and mindfulness of the population in Lingwala town (Kinshasa, DRC) on what are their rights and obligations toward solid waste management, and collecting information on the ground for the local leaders in order to help them in management of the solid waste.

1.7 Assumptions of the Study

- There are no waste management strategies to reduce the impacts on solid waste management
- Having strategies for solid waste management that can reduce the impact of solid waste management in Lingwala, Kinshasa
- There are no effects of project planning on the performance of solid waste management projects in Lingwala, Kinshasa.
- There is no effect of project funding on the performance of solid waste management projects in Lingwala, Kinshasa.
- There is no effect of the role of households on the performance of solid waste management projects in Lingwala, Kinshasa.
- There is no effect of personnel skills on the performance of solid waste management projects in Lingwala, Kinshasa.

1.8 Significance of the Study

The results of the study might serve as of importance to the policymakers of the place whose mandate is to provide a safe environment for the well-being of people and staff present in the community of Lingwala in Kinshasa city (DRC). It will also assist in the adoption of new effective ways and potential strategies and technologies that can be used to keep the environmental effects of improper solid waste management at bay.

1.9 Delimitation of the Study

This study is focused on solid waste management strategies in Lingwala, Kinshasa city; how people are dealing with solid waste management in Lingwala. The chosen area of this study is Lingwala in Kinshasa city because it is a place where there is a higher density

of population bearing on solid waste management. In the Democratic Republic of the Congo, the research will be limited to this area because the DRC in its entirety is too big for a precise and effective solid waste management. The research mainly highlights the problems such as the gap between the practices and the policies not completed and the impacts on the population. The research is focused also on political, social-economic, and environmental implications on solid waste management in Lingwala area.

1.10 Limitation of the Study

The researcher might fail to get the targeted participants for the questionnaire survey due to the refusal of some individuals to participate. Some participants might be timid and feared that the researcher might have been a member of a political party soliciting information that would be later linked to them. The population on the ground might also suspect the researcher to be an agent of the department of environment. Therefore, they will think that if they open up too much, they will be victimized. Some participants might be afraid to answer questions, thinking since the questions are related to solid waste management strategies, the government wants them to stop their activities and therefore prohibit them to fulfill their daily activities on which they rely to survive. These challenges will be mitigated by the involvement of community leaders such as traditional councilors who will guarantee and explain to their community members that this will be solely scholarly research. They will help clear the air about the objectives and purpose of the study which will make participants open up. In each place, the researcher will be given a community member to accompany him for introductions.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Solid This chapter reviewed a selection of literature which had a bearing on an assessment of solid waste management policy in Lingwala, Kinshasa, DRC. The chapter also sought to provide some background to different effectiveness of the current policy in theoretical framework of policy implementation, in particular, in and outside the Democratic Republic of Congo.

Solid waste is continuously emerging as an existing global problem around us in the world and have taken their toll on humanity (World Bank, 2019). The huge increase of the human population over the recent years has called for the need to accommodate more space for people to live in, in the environment and for more food to be produced and supplied to the increasing consumer demand. For this to be accomplished, the industrialization has become one of the growing sectors in recent years (Signé, 2018) which is primarily centered on producing enough food products to feed the population that are overgrowing and satisfy the increase in consumer demand in the world. The urbanization is one of the after effects of the increasing urban population since people, public, and society now tend to move from rural areas to live in urban areas to work, in places where the industries are located in order to improve their livelihoods through the income gain. The problem then lies in the remains discarded off from the utilized goods, and these remains are considered as garbage, waste, and useless material which are then immediately indiscriminately disposed into the environment. This has not been a productive solution and it has led to the accumulation of solid wastes within environmental bounds which has worsened and degraded the quality of the environment by causing and producing pollution that poses a

threat and danger to both the well-being and health of people in different communities living within the polluted environment that are contaminated.

2.2 Theoretical Framework

Theoretical framework is the blueprint or guide for a research (Grant & Osanloo, 2014). In addition, it is a framework based on an existing theory in a field of inquiry that is related and reflects the hypothesis of a study. It serves as a foundation upon which a researcher is constructed. Sinclair (2007); Fultron and Miller (2010) compared the role of theoretical framework to that of a map or travel plan. Thus, like when you are traveling to a particular location, the map guides your path. Similarly, the theoretical framework in this research guided the researcher from not deviating from the scope of the research and theory.

Systems Theory, developed by Ludwig von Bertalanffy in the 1950s, views complex phenomena as interconnected systems. This framework emphasizes wholism, interconnectedness, and feedback loops, helping us understand how components interact and influence each other. In solid waste management, Systems Theory is significant because it encourages a holistic approach, considering social, economic, and environmental factors. By recognizing the interconnectedness of waste generation, collection, treatment, and disposal, policymakers can design more effective and sustainable waste management systems.

Empirical evidence The city of Curitiba, Brazil, implemented a systems approach to solid waste management, achieving high recycling rates and reduced waste disposal costs (Source: World Bank, 2010). Similarly, Masdar City, Abu Dhabi, adopted an integrated solid waste management system, diverting 90% of waste from landfills (Source: Abu Dhabi Waste Management Center). These examples demonstrate Systems Theory's

effectiveness in improving solid waste management outcomes. By applying this theory, cities worldwide can develop more sustainable and efficient waste management systems.

2.3 Relevance of the Theoretical Frame of the Study

Systems theory, which provides a comprehensive framework for comprehending the intricate interactions within waste management systems, is revolutionizing solid waste management. Policymakers are encouraged by systems theory to take into account social, economic, and environmental aspects of the waste management system as a whole. This method assists in locating possible bottlenecks and opportunities for improvement. The production, collection, treatment, and disposal of waste are all interrelated parts of a bigger system. Because systems theory acknowledges these connections, planners can create waste management plans that are more successful. Policymakers can make better judgments that strike a balance between conflicting priorities like social equality, environmental sustainability, and economic efficiency by taking the system as a whole into account. Many parties are involved in solid waste management, including communities, businesses, and governmental organizations. By encouraging cooperation and coordination among various parties, systems theory produces better waste management results.

2.4 Solid Waste

Under Waste Framework Directive, 2008, the European Union (EU) defines waste as an object that an individual possessing or owning it discards, wills to discard or will be required to discard.

Solid waste is any trash or garbage that is generated from undesirable or useless materials (Desa, Kadir, & Yusooff, 2011) as byproducts of human activities which are inevitable or

unavoidable (Sinha et al., 2008). According to EMA in Zimbabwe, 2015, Solid wastes come from numerous sources such as illegal vendors, hospitals, supermarkets, households, clinics, manufacturing industries, construction industries, residential areas, and motor industries. The rapid ubarnization, population growth, industrial growth, improved lifestyles and unsustainable consumption patterns have been directly linked to the growing, rising and ever-increasing solid waste problem (EMA, 2015). The material of solid waste can be generated in the time of extraction of raw materials, the processing of these materials into intermediate and final products and the result of the consumption of final products (UNDF, 2003). There are four types of waste which involve:

1. Municipal solid waste that includes household waste, demolition waste, and commercial waste;
2. Biomedical waste that includes clinical waste
3. Hazardous waste that includes industrial or engineering waste
4. And Electronic waste (e-waste)

2.4.1 Municipal Solid Waste

A municipality refers to a village, city or town that is usually governed by a council and mayor. It is a single urban area that has corporate powers and status of self-government /jurisdiction that are granted by the national and state laws to which they are subordinate to (BK101, 2019). Municipal Solid Waste which may also be referred to as garbage, waste or refuse consists of everyday items that are discarded by the community or public in towns and cities within urban areas (EC, 2008). The composition of municipal solid waste is varied from municipality to municipality, and it is inevitable that it changes significantly

with a given time period (Perry, 2017). Municipal solid waste can be categorized into three parts namely: Biodegradable waste, recyclable waste and inert waste.

2.4.2 Biodegradable Waste

Biodegradable waste can be defined as material that can be decomposed by bacteria or any other natural organisms in the World. It includes any organic matter in waste that can be broken down into water and carbon dioxide. Examples include human waste, paper and food waste, manure, hospital, waste, food waste, and dead animals and plants. Biodegradables consist of organic material that come from food scarps or crop/plant residues that may potentially serve as feed for the soil (Agostini, 2012).

2.4.3 Recyclable Waste

Recyclable waste is any used material that can be collected and processed into new useful different products from its original state. It is known as a process of recycling because other than throwing the used materials away as trash or waste, it is processed and turned into a new product (EPA, 2018). Recyclable waste involves plastic material such as plastic bags, materials such as paper, glass, cardboard, aluminum cans, clothes, tires and any other materials that can be processed and used again as useful products.

2.4.4 Inert Waste

Inert waste is the waste which cannot be biologically or chemically reactive and does not decompose in the Earth within the space or planetary of time (Pilipavicius, 2015). Insert waste involves the discarded material of demolition and construction waste which are regarded as wreckage and useless in the environment. Examples include sand drywall, gravel, concrete and botanic material (Hunt, 2014).

2.4.5 Biomedical Waste

Biomedical waste is any kind of waste that is potentially contaminated with infectious materials (WHO, 2018). It is any waste that appears to be of medical or laboratory origin. Biomedical waste consists of waste that originates from the hospital or clinic sector such as expired pharmaceutical drugs, contaminated vaccines, discarded gloves, used sanitary pads, used cotton buds and bandages, syringes, scalpels and broken glass, plaster casts, tubes, catheters, and sterilant (WHO, 2018).

2.4.6 Hazardous waste

Hazardous waste is the material that when disposed pose a substantial or potential danger and capable to harm the environment and public health, and these involve; explosives, flammable objects, toxic substances, oxidized materials, and poisonous or infectious materials (Muralikrishna, Manickam, 2017). The improper management or treatment of these wastes causes a serious threat to the environment and human health on Earth (EPA, 2019). Some examples are materials such as; paints, fertilizers, chemicals, light bulbs, batteries, cans, fluorescent lamps, electrical appliances, and aerosol sprays.

2.4.7 Industrial Waste

Industrial or engineering waste is generated from industrial activities and this involves the material that is rather discarded and regarded as useless during a process of manufacturing in factories, mills, or mining operations (Chinaza, 2017). Some of the examples of industrial waste include; chemical solvents, paper products, scrap metals, cafeteria garbage, oil, dirt and gravel, and scrap lumber (SDWF, 2017).

2.4.8 Electronic waste (e-waste)

Electronic waste is electrical devices that are discarded, have become unwanted and undesirable, and have reached the ultimate end of their useful life (Jain, 2015). Examples of e-waste include discarded computers, mobile phones, television sets, office electronic equipment, and refrigerators.

With the buildup of all these wastes, there is an estimate of 2.01 billion tons of wastes that countries produced per year as of 2016 which amounts to a footprint of 0.74 kilograms per person in a single day. With this statistic, The World Bank estimates that the waste generation will increase to 3.40 billion tons of waste by the year 2050 (World Bank, 2019).

2.5 Solid Waste Management

Solid Waste Management can be referred to as the control of refuse that is disposed into the environment as by-products of human activities. SWM can be often associated with storing, managing, collecting, and processing garbage material by following the desired standard of conservation, general public health, economics, and other environmental concerns (Rahmaddin et al., 2015).

2.5.1 Integrated Solid Waste Management

Integrated Solid Waste Management refers to a strategic approach to the sustainable management of solid wastes covering all aspects and sources, the generation and segregation, transfer, sorting, treatment and overall disposal of solid waste in an integrated manner, placing an emphasis on the utilization and maximization of resource use efficiency (UNEP, 2016). ISWM combines different waste management techniques in managing and treating different types of waste in ways that are environmentally friendly, socially acceptable, and financially sustainable (Abdel-Shafy, 2018). Integrated Solid

Waste Management is solely based on the waste hierarchy and generally focuses on the use of the 3 Rs which involve; Reduce, Reuse, and Recycle the waste material. It emphasizes on finding and discovering suitable ways of dealing with the remaining unwanted waste present in the environment.

Integrated Solid Waste Management is built around the three sustainability pillars namely: effectiveness, equity, and efficiency (Klundert &Anschütz, 2001). Clearly, for any project, activity, or program to be effective, it must be sustainable for it to be able to exist for a long duration; And in order to achieve sustainability, environmental, social, and economic factors must always be put into consideration.

2.5.2 Effectiveness

The methods used in waste management must comply with the overall aims of any plan of solid waste management and be in line with the needs of the society and people (Klundert &Anschütz, 2001). At the very least, effectiveness is when waste is collected and disposed of in ways that are environmentally friendly. Once this has been done and accomplished, higher-level aims that include the maximisation of waste recycling and composting should be addressed. Again, a plan is only effective if it covers the whole city, municipal, or district. In a nutshell, effectiveness is about a waste management model that can be applied in order to achieve the safe removal and deduction of all waste materials in the environment.

2.5.3 Equity

Equity deals with the allocation of resources, services, and opportunities to all segments of the population according to their needs (Klundert &Anschütz, 2001). In waste management, this applies that every individual possesses a right to be serviced by a waste

management system that protects their health and environment. The pollution inevitably goes anywhere and does not respect area boundaries or limits, so if a particular location or area is neglected, a much larger area can hence suffer.

2.5.4 Efficiency

Efficiency is the management of all wastes done by maximizing the benefits, optimizing resource use, and minimizing costs (Jiae, 2017). In general, taking into account equity and effectiveness, efficiency means an increase in output for a given input, or reducing input for a given output. An efficient solid waste management system is one that is effective and equal while making the best use of the resources available through the stakeholder effort and the use of equipment and costs (Klundert &Anschütz, 2001).

2.5.5 Advantages of Integrated Solid Waste Management

According to United Nations Environment Programme (UNEP, 2009), there are four advantages of ISWM:

1. Reduction and reuse at source – reducing waste at the source and reusing wastes in general means that less waste has to be collected and hence, fewer costs are incurred.
2. Waste separation at source – helps in making society and people more aware of what they throw away and means that the material separated for recycling is of higher quality and has a higher selling price.
3. Recycling – causing less pollution and reducing the need to extract raw materials from the environment or to import them.

4. Organic waste recovery – causing a reduction in the amount of waste sent to landfills and using compost to improve soils and grow crops. It also serves a purpose in biogas systems that produce the energy for cooking and lighting.

2.5.6 Stakeholders of Solid Waste Management

Stakeholders in SWM are people and organisations that generate waste and are responsible for good waste management practices through participation in these activities to make them possible (Kurian, 2006). Stakeholders in SWM involve the central and local governments, Non-governmental Organisations, research and academic institutions, the private sectors including funding agencies, and the general society (Kurian, 2006). SWM requires a concentrated effort throughout the process of its management and the level of stakeholder involvement varies from place to place. Efforts can be made at all levels to reduce the generation of wastes and the environmental impacts of waste through stakeholder involvement (Wilson & Tormin, 1998). It is therefore, necessary to identify stakeholders and their areas of interest and degrees of involvement in waste management in order to facilitate its effectiveness (e.g. funding, training, waste collection, recycling etc.)

2.6 Influencing Factors

Several factors manipulate the selection, operation and effectiveness of any solid waste management programme and always need to be considered when planning a successful ISWM programme (Open University, 2016). These factors involve; Technical factors, political factors, environmental factors, financial factors and social factors.

2.6.1 Elements of a SWM Process

Activities of the SWM process start from the point of where its generated till the final disposal (Klundert &Anschütz, 2001). It has been grouped into six functional elements namely: Waste generation, On-site handling, storage and processing, Collection, Transfer and Transport, Processing and recovery, and Disposal

2.6.2 Waste Generation

This is the stage where materials are ascertained to no longer have bare value and are either discarded or compiled together for disposal. Solid waste is produced in the beginning with the use of raw materials and thereafter at every step in the process as the raw material is converted to a product for consumption (Klundert &Anschütz, 2001). The information obtained on waste generation is pivotal to determining the most suitable waste disposal options.

The rate at which solid waste is generated is affected by its Geographical location, Season of the year, Frequency of collection, Characteristics of the population, Extent of salvage and recycling, Legislation, and Public attitude.

2.6.3 On-site handling, Storage, and Processing

There are four factors that should be considered in the on-site storage of solid waste and these are; the type of containers to be used, the location where the containers are kept, the collection method, time, and public health (Klundert &Anschütz, 2001).

- Importance of on-site processing:
- Reduces volume of waste generated
- Alters physical form

- Recovers usable materials

Factors that should be considered in evaluating on-site processing are

- Capabilities
- Reliability
- Environmental effects
- Ease of operation, etc.

2.7 Collection

This is the activity associated with the gathering of solid wastes and the hauling of wastes after collection to the location where the vehicle carrying the solid waste is emptied (Klundert &Anschütz, 2001). The frequency of collection is dependent on the quantity of solid waste, the time of year, the socioeconomic status of the area served, and municipal responsibility. In business districts, refuse should be collected daily. In residential areas, refuse is collected twice a week during warm months of the year, and once a week during other times should be the maximum permissible interval. Slum areas usually require at least twice-a-week collections.

2.7.1 Transfer and Transport

This involves the transfer of waste material from the smaller collection vehicle to the larger transport vehicle and the subsequent transport of the wastes, usually over a long distance to the disposal site (Klundert &Anschütz, 2001). Transfer stations include stationary compactors, transfer containers and trailers, recycling bins, material recovery facility, transfer packer trailers, or mobile equipment.

2.7.2 Processing and Recovery

These are techniques, facilities, and equipment that are used to improve the efficiency of the other functional elements and to recover usable materials, converting products to energy from solid wastes. Resource recovery is partially solid waste disposal and reclamation process. It can account for about 60% of reductions in future landfill volume requirements (Chandrappa, 2012). The recovery of resources must recognize what is worth recovering and the environmental benefits tied with it. They demand both capital and operating costs and market value of reclaimed materials and material quality. The assured quantity of solid wastes requires the need for sanitary landfills for the disposal of excess and remaining waste materials and incinerator residue. A site location is required close to the center of the generators of solid waste.

2.7.3 Solid Waste Disposal

The indiscriminate disposal and improper management of solid wastes create room for serious health and environmental problems (Neller 2015). The associated risks of poor solid waste disposal may include; disease transmissions, pollution and an effect on morale.

On the aspect of disease transmissions, the decomposition of organic material may attract vermin, flies, and animals which are primary transmitters or carriers of disease-causing substances. Flies play a pivotal role in the transmission of fecal-oral diseases, especially in areas where domestic wastes contain feces. Rodents are likely to increase the transmission of diseases such as leptospirosis and salmonella (Kassim and Ali 2006; Abul 2010).

Solid wastes harbor pathogens and promote the spread of diseases such as cholera, typhoid and dysentery (EMA, 2015). These wastes also provide a convenient breeding site for

mosquitoes. The Aedes genus of mosquitoes lay eggs in water stored in garbage items such as tins and drums and these are known to be responsible for the spread of dengue and yellow fevers. Such conditions contribute to attracting anopheles' mosquitoes, which transmit malaria. The Culex genus of mosquitoes breed in stagnant water which is rich or high in organic content and at the end transmits micro filariases (Médecins Sans Frontières, 2004). In times of famine or food scarcity, some needy people of the affected population may be attracted to waste heaps to scavenge for food and make ends meet; this is likely to increase the risk of gastroenteritis, dysentery, and other gastro-intestinal illnesses such as hemorrhoids, irritable bowel syndrome, perianal abscesses, anal fistulas, diverticular diseases, colitis, and perianal infections.

On the aspect of pollution. Solid wastes contribute to both land and water pollution. Accumulated wastes on land surface is an eyesore and lead to the loss of aesthetic value of land, taking away the beauty of cities and towns. This could have a negative effect on the country's tourism industry (EMA, 2015). Existing non-decomposable material on the land may degrade the soil quality, promote erosion and hinder the growth of vegetation. Solid wastes that are washed off from the land into nearby water bodies end up polluting the water and thus degrading its quality making it unsafe to use for human consumption and other related human activities because of the foul smell and its capability to result in the contraction of diseases. Solid wastes are also capable of blocking the passages of water and sewer drains which may cause the water to be stagnant and offer a certified invitation to mosquitoes and flies which transmit diseases. According to a case study done in Rawalpindi city in Pakistan, it stated that, blocked drains by solid wastes and wastewater flooding in the city were greatly supporting the breeding of mosquitoes which were

spreading malaria and dengue in the area. The case study also stated that discarded polythene bags are generating an aesthetic nuisance and they may also cause the death of grazing animals which eat them, thus the loss of grazing livestock.

The aspect of poor solid waste disposal having an effect on morale, may be induced from the unhygienic and untidy environment that people are living in which may lead them to become demoralized and less motivated to improve the conditions around them. Individuals living in such poor environmental conditions may become complacent and accept things as they are even though their surrounding is a nuisance to the eyes and aesthetic wise. Waste eventually attracts more wastes and leads to less hygienic behavior in general.

On the 28th of July, 2013, The Standard DRC (News), reported that waste management, in Kinshasa had reached critical levels with waste material being dumped on the roads, rivers, wetlands, in the woods, and everywhere else in the city. With that at hand, the paper claimed that the action posed a serious health risk and was also leading to the damaging of the soils through toxification. The paper proposed that it was a mandate to look at the possibility of commercial recycling of solid waste. The paper did not include at what level the people of Kinshasa knew about recycling and whether they embraced it as a waste management strategy.

Improper waste disposal inevitably results in land and water pollution. The sole purpose in implementing best practices for solid waste management is to prevent pollution. Pollution poses a threat to humans and other biotic species (Morra et al., 2009; Liu & Morton, 2010). It is also a potential component that damages the ecosystem and disrupts the natural cycle and climate on earth (Raga et al, 2001). There are many solid waste

disposal options available to suit the nature of waste, it only depends on a country's preference and interest in accordance with their economic status to choose which may best be applied for them. The several methods of managing solid wastes include activities such as; Incineration, composting, sanitary landfills, dumping into the seas, and fermentation/biological digestion systems. Not all of these stated strategies are efficient and reliable but some have full potential to effectively eliminate waste material and reduce its impacts. And despite the development of several waste disposal options, landfills remain the most prominent system applied worldwide (Shekdar, 2009; Hamer, 2003). Improper landfill operations involve, health deterioration, flood occurrences, accidents, pollution of surface and underground waters, pest infestation, and unpleasant odor and gas explosions. Although these impacts from landfills are known, impacts from other alternatives remain unanswered, hence subject to critics (Hamer, 2003).

2.7.4 Incineration

Incineration is a waste treatment technology, that supports the combustion or burning of solid waste to produce energy. The procedure of incineration deals with waste material that is treated and then converted into gas particles and heat. These products are later used for generating electricity. Though incineration stands taller among waste-to-energy technologies, they have recently been known to cause significant health, environmental and financial impacts on residents in communities. The total sum of energy produced by incinerators is considerably less than the amount saved by recycling, and with a greater cost to public health (Clean Water Act, 2019). Incineration produces more carbon dioxide per kilowatt-hour than any other form of power generation, further contributing to climate change (Environmental Protection Agency, 2016). Combustion at incineration sites

contributes to 33% more greenhouse gases (GHGs) into the atmosphere as compared to archaic coal-fired technology. Incinerators reduce the amount of wastes present and provide more space in landfills, but only by 20% that is typically asserted.

2.7.5 Dumping Waste in Seas

Sea dumping has been one of the practices in managing solid waste, especially in coastal cities. Dumping involves depositing waste materials that originate from factories and industries into the oceans and seas. Other waste materials that land into water bodies come from non-point sources of pollution, which is a result of land runoff that brings waste materials from the surface such as debris from cars and boats into the sea every day. It is costly and not environmentally friendly.

2.7.6 Composting

Composting is a natural process that involves turning organic material into a dark rich substance which is called compost or humus. Organic material may include all those that originate from the ground and are capable of undergoing through the process of decomposition. The result of the decomposition of organic material can later be used to feed the soil or act as a conditioner for the soil in improving its texture and overall quality. This method of waste management is certainly beneficial in the agricultural sector for better soil grounds that can potentially promote the healthy growth of crops and vegetables which may ultimately lead to more accrued yields. Thanks to composting the amount of refuse or wastes sent to the landfills are reduced and the organic matter is later re-used and recycled into a useful soil amendment (Cornell Composting, 2015). Formulating successful systems of composting requires an understanding of certain biological,

chemical, and physical processes such as air movement, uptake of nitrogen and carbon particles, and heat production and transfer.

2.7.7 Sanitary Landfills

Sanitary landfills are areas where solid wastes are isolated from the environment until they are safe (Gotvajn - 2015). Sanitary landfills are cheap, simple and effective. Refuse is laid in layers which are compacted by a mechanical equipment and covered with earth. With time, the fill settles and micro-organisms act on the organic matter and degrade them. The decomposition process is similar to that which happens in composting. Moisture content is not less than 60% for good biodegradation. Refuse depth is limited to 2 meters deep and temperature in the initial stages of decomposition goes as high as 70 degrees Celsius (The Constructor, 2018). These sites are considered when they have completely degraded biologically, chemically and physically. In developed countries, the level of isolation achieved may be high. However, an expensive high level of isolation may not be reasonably necessary to protect public health (Thurgood, 2015).

2.7.8 Biogas Systems

Biogas is a type of biofuel that is produced through a natural process of decomposition of organic waste in a plant (Home Biogas, 2018). Organic matter, such as food scraps and animal wastes are broken down in an anaerobic environment which then releases a blend of gases, primarily methane which accounts for 60%, and carbon dioxide which accounts for 40% (Tiepelt, 2016). Methane is a combustible gas and can be utilized in the same way as fuel for cooking, water heating, lighting, and space heating and essentially generate electricity. The anaerobic digestion process also removes most of the harmful pathogens from the waste, but not the nutrients, thus producing a high-quality organic fertilizer as

effluent which can be used by the soil as a conditioner to promote and sustain the growth pf healthy vegetables and crops (Tiepelt, 2016). Since the process of decomposition happens in an anaerobic environment, the process of producing biogas is also known as anaerobic digestion (Home Biogas, 2018).

2.8 Awareness of Solid Waste Management

Solid waste management cannot exist without the people within communities being aware of the impacts poor solid waste disposal has on the environment. It is necessary for people to be educated in order to understand the implications or consequences of indiscriminately disposing of waste into the environment. Therefore, for a successful solid waste management program education is critical. Offering education to people and servicing them, invites them to participate in waste management programs can help them understand the issues to do with waste and the repercussions it has on human and environmental health by then developing ways to keep these consequences at bay (Chakraborti, Hussam & Alauddin, 2003).

According to a study by Training and Research Support Centre (2010), the municipalities in DRC stated that cities in DRC were failing to cope with the demands of waste collection mainly from the highly-populated suburbs. The study showed that levels of awareness of alternative methods of handling waste, such as recycling and reusing were quite poor, as households disposed of leftover food in the waste bins. However, the report also observed that people were passionate and willing to take action and part in solid waste management initiatives. However, the study did not report how the people of the communities used the acquired knowledge they had on waste to improve its management.

According to the World Bank (2012), most residents of Kinshasa were not aware of regulatory policies put in place concerning waste management. Where argued that people were just dumping waste material in places that were convenient to them. The World Bank determined that there was no coordination between the municipality and the residents. The people played no part in the act of managing waste and the municipality perceived the residents as clients whom service was being provided to with a provision of payment. Education of the community was called for, in order for waste management to start at the source (households) where the three Rs (reuse, recycle, and reduce) can be easily implemented.

Improving Solid Waste Management, especially in highly-populated cities of developing countries, is emerging as a more and more urgent issue to be looked into (World Bank, 2012). The report shows that Solid Waste Management is the most crucial service a city should be able to provide considering that municipalities that are unable to manage waste end up failing to provide related services like education, roads, and health due to waste buildup. According to the World Bank (2012), public education should be done to inform people of alternative options available in the management of waste. The World Bank also advocates for an integrated solid waste management plan which must include all stakeholders including the poorest or the lowest-income communities, to therefore emphasize and improve waste management. The undeniable feature is that community participation is essential and an urgent need in order to see progress in societies in solid waste management.

The attitudes, behavior, and practices of people towards solid waste management, illustrated that the behavior level and practices of people regarding solid waste

management programs were high (Desa, Kadir & Yusooff, 2012). Despite this, researchers responsible for the study noted that education and awareness of waste strategies are perhaps still crucial to developing more people's attitudes and awareness in the managing of solid waste to reduce the impact of the waste problem in Kinshasa.

Given the context, education is pivotal to the adoption of the solid waste management program. Educating people on issues concerning waste management will help them recognize the indiscriminate disposal of waste to the environment and human health and empower them to act accordingly (Chakraborti, Hussam & Alauddin, 2003). But awareness alone, cannot exactly be translated into practice. For instance, Ifegbesan (2010) investigated the level of awareness and practices of solid waste management in Nigeria. The research involved the use of a self-administered questionnaire, and the results proved that people were aware of the serious impacts of poor waste management in their places, but they possessed poor waste management practices. The study further stated that people’s knowledge and practices regarding solid waste management significantly differed when they were grouped and segmented according to sex and age.

A case study on Rawalpindi city stated that in Pakistan, due to unplanned communities and developments in the major cities, environmental and sanitary conditions are becoming very intricate. Because of a lack of awareness and low-income sources, dwellers are pushed to live with unhealthy and unhygienic conditions. An improper solid waste management system and a lack of technical know-how or general awareness about solid waste management practices may contribute to a worsening environmental degradation of the community.

A study in Nigeria found that the level of awareness, knowledge, and practices of people in regard to waste management showed that the propensity for solid waste management practices differ by sex, and age of people (Ifegbesan, 2010). The results illustrated that there was absolutely a significant relationship between the people's class, sex, and age with their level of awareness, knowledge, and practices of waste management. This information was collected with the use of a structured, self-administered questionnaire in which people were surveyed from cities. The data collected was subject to percentage, mean, standard deviation, chi-square statistical analysis, and a t-test. The findings unveiled that people from the sampled zones were quite aware of waste problems in their places, but still lacked or possessed poor waste management practices.

A research study in Erzurum, Turkey showed that the awareness and sensibility levels of people in the city concerning environmental problems were found to be 64.4%, which may be considered as moderate (Yildiz, Yilmaz & Demir, 2011). Although people may show awareness of the problems being faced, they simply do not give importance to them. In this regard, the researchers suggest that actions to be taken should involve the repetition of the studies on the establishment of environmental sensitivity and formulation of policies based on their findings.

17, 000 tons of waste are produced each day in Malaysia. Despite the complex amounts of waste being produced, the standards of waste management still remain poor in the country and this certainly serves as one of the greatest challenges facing the country (Desa, Ba'yah, Kadir & Yusooff, 2010). The possession of outdated documentation of waste generation rates plus its composition, the inefficient collection and storage systems, indiscriminate disposal of wastes in municipalities, and the inefficient utilization of

disposal site spaces all contribute to the challenges that are within Malaysia's standards of waste management. Delving more into the study, the lack of awareness and knowledge among Malaysian communities concerning solid waste management issues has made them become ignorant about the effects that come with improper solid waste management, and thus, this has led to the worsening of the problem. Environmental awareness is critically low in Malaysia and the Local Authorities tend to complain about the lack of cooperation from the general public with regard to the provision of solid waste management services. Though the National Recycling Program (NRP) conducted by the Ministry of Housing and Local Government has contributed to the increase in the level of awareness of the need to preserve resources, the response of the public to this issue has still been disappointing (NRP for solid waste management, 2005).

Taking note of the seriousness of solid waste disposal, it is, therefore, vital to conduct the necessary research in identifying the awareness levels or sources of knowledge, attitudes, and level of practices adopted by public communities in matters concerning solid waste management in order to derive measures that can reduce or mitigate the threats and environmental impacts that come with it.

2.9 Attitudes and Perceptions towards Solid Waste Disposal

Attitudes are a crucial concept in helping people to recognize and apprehend their social world. They essentially help us to define how we view and think about others, as well as how we control our actions or behave towards them (Wayne State University, 2004).

An attitude is a person's general opinion and evaluation of something which causes them to behave in a certain way (Schleicher & Watt, 2016). Psychology defines attitude as the propensity to evaluate a particular object or situation in a favorable or unfavorable way,

which induces how someone behaves towards it. This definition was further backed by Teo & Loosemore (2003), who emphasized the importance of attitudes to those that have them, as they help individuals to categorize, structure, and prioritize the world around them. Hence, attitudes serve as of importance to managers, as they ascertain people's behavior and often give off an insight into their motivating values and beliefs. There are basically two concepts concerning the development of attitudes (Wayne State University, 2004):

1. By changing the environment

Some individuals tend to say that matters are put in place to make people have to behave in a certain manner and eventually their attitudes may have to change and be in line with the arrangements put in place in the environment. For example, the reuse and recycling of waste matter can be made a rule on site.

2. By changing attitudes

The second school of thought/concept is said that if one could change a person's attitude, their behavior goes in sync and changes accordingly. For example, addressing the importance of implementing waste management practices can be conveyed to students and staff.

While it is true that human behavior or actions are driven by a person's intention and attitude, there is also a developed argument that self-interest plays an important role in the decision-making and actions of individuals (Madrigal, 2018). According to the Rational Choice Theory, individuals tend to act with prudence and logic (Green & Fox, 2007). A persons' decision to act or not to act accordingly can be based on rational calculation, and

a choice is often made on available options that guarantee one the greatest satisfaction (Green & Fox, 2007). This means to say that; human behaviors may also be ascertained by self-interest based on the pleasure and gratification of not doing or doing something. Hence, the theory implies that proper waste management cannot always be altruistic, but it is rather influenced by weighing out its cost and benefits.

2.10 Summary

This chapter presented the relevant theoretical framework, existing literature on solid waste management, covering key concepts, types of waste, and approaches such as integrated solid waste management. It also examined factors influencing waste management, including institutional capacity, funding, public awareness, and stakeholder involvement. The next chapter will focus on the methods that were used to collect data.

CHAPTER 3 METHODOLOGY

3.1 Introduction

The fieldwork of this research was conducted in Lingwala municipal, Kinshasa city in the Democratic Republic of the Congo. Data and other information relating to solid waste management in the Democratic Republic of the Congo were collected from February 2026 to March 2026. However, finding such information was really difficult and not easy due to the current situation in the country and the unavailability of the information in the DRC because of the condition of the political issue of the country has caused the access of managing the solid waste being extremely dangerous and restricted. This research was conducted in order to assess the existence of solid waste management strategies. During the research fieldwork, the methods of participatory action research (PAR) was used to find out how the community participated in the policy implementation. The methods of participatory action research approach were important because it involved the participation of the local people in the research activities (Chambers, 1990).

3.2 The Research Design

In this research, the researcher used the case study research design with a pure qualitative research approach. Qualitative research design is a research design that uses non-numeric data like words including all types of textual analysis to understand the meaning of human experience in a humanistic and interpretive approach (Jackson II, Drummond, & Camara, 2007). This design presented a detailed picture of the ongoing situation of solid waste management in Lingwala, Kinshasa city (DRC), regarding the strategies of solid waste management. This study strove to investigate and describe the involvement of the population regarding solid waste management strategies. The case study was one of the

methods among several others of researching social sciences but fitting for the natural resources research as they are rarely uniformly distributed. And it was a method that narrows down very broad research into one topic by focusing on a particular situation in great depth, thus giving space for elaboration (Lararee, 2018). In this research, Kinshasa constitutes a unique situation in the DRC since it is a populous city that brings numerous challenges in terms of solid waste management in the Democratic Republic of the Congo. The researcher was able to interact with participants through the use of questionnaires. The researcher also used such interactions to bring out the participants' understanding and live experiences of the local management practices of solid waste. This method was suit this study because it helped to have a close view of the participants' way of living in their respective areas and set aside any biases in their responses, point of view, and perception on the policy of solid waste in the community.

3.3 Population and Sampling

The population of this research was made up of the population in Lingwala municipal. The total population in Lingwala as a municipality is 94,635 estimated by the government of DRC; both males and females aged 18-56 years old was involved during the collection of data. The researcher prefered to choose this category in this study population because of the precision of the knowledge they have and the challenges they meet about the management of solid waste in Lingwala.

3.3.1 Sampling Techniques and Size

Sampling techniques is a method that helps the researcher to gather information about the population based on the collection of data from the population subset without investigating every individual of the population (Tadakuluru, 2021). Data collection from such the

population contained all the characteristics of the population, including the nature and behavior of group members. It was not possible to collect information from this whole population, because of huge costs of living, and time constraints that was given to the researcher by the commissioner's environment officials.

3.3.2 Purposive Sampling

The researcher was using purposive sampling to select the key officials from Lingwal, Kinshasa City council, local leaders, and resident associations who had the knowledge on the research study to be conducted. According to Alchemer (2021), purposive sampling involves the researcher relying on his judgment to choose members of the population to participate in the research study as key informants. The researcher understood the effect of solid waste or how solid waste had affected the population in Lingwala area and how people of Lingwala area are coping with the policy of solid waste management. It also helped the researcher to select people with knowledge on solid waste management resilience so that the strategies and policies could be recommended proposed to address the management of solid waste.

The advantages of this method in this research were, the researcher was selecting participants with information on how solid waste affected people in Lingwala town in order to respond to the research question design, the information from participants on how people are coping with solid waste. The selection of participants with information for the different research questions helped the researcher to collect the appropriate data needed for the research study. So the weakness of this method was the possibility that those who had the information were not available and the select participants were also not able to provide sufficient information needed to achieve the objectives of this research.

To address the weakness that was raised, the researcher employed the method of triangulation. The triangulation method helped to increase the credibility and the validity of the research study to address the weaknesses (Noble & Heale, 2019). The researcher was using the data source triangulation by obtaining data from different sources, but will not the studies of these data was used for, thus increasing the validity and credibility of the research.

3.3.3 Convenient Sampling

For this study, convenience sampling was used. Convenience sampling, which might also be known as availability sampling is a type of non-probability sampling method that relies on primary data from population members who are accessible or conveniently available to participate in the study (Dudovskiy, 2012). This method involves the use of the first available primary data source which can be used by the research without additional requirements. In this sampling method, no inclusion criteria were identified prior to the selection of participants. All subjects were therefore invited and able to participate.

The study adopted this method of sampling because of the advantages that come with it. Based on the name itself, data can be obtained on a convenient basis. In fact, participants for this type of study can be just within the researcher's reach, and therefore, the researcher doesn't need to struggle or exhaust much effort into collecting or gathering data elsewhere (Ayres, 2016). This method was also chosen because it saved time by gathering data in a much shorter span of time as compared to other methods. The method was only inclusive of a handful of people that was easily approachable or within reach and this was rather a much less tedious strategy for the researcher. The method also helped in saving costs. If one is to conduct a research, it normally necessitates one to spend a great deal of money

to accomplish the objectives of the research. However, this sampling method allowed the researcher to inquisitively collect desired data of potential respondents within this researcher's reach without incurring as many costs as it would if other sampling methods was used. This was an excellent alternative since the researcher funded the project on one's own initiative through the helping hand from guardians, hence this was rather a more reliable option.

Despite the advantages stated, there was however some disadvantages that come with the use of the convenience sampling method. Data gathered may possibly be bias because the method may only get the views of a specific group of people and may potentially not represent the entire population (Ayres, 2016). With this, some groups were over-represented or under-represented and this had an effect on the quality of the data being gathered. However, the research was affected by this disadvantage because the researcher was ensuring this by managing to target all accessible subjects of different localities and engaging with all those that was interested to take part, and ensuring follow ups will be made on both online and physical handed copies of questionnaires that was used.

3.3.4 Sampling Size

According to Dworkin (2012), a minimum of 25-30 participants is an appropriate sample size for qualitative research to reach saturation during detailed interviews. In this study, the sample size of 60 participants was identified whereby forty-eight (48) participants both males and females from the inhabitants was targeted as respondents in this research. Also, the researcher had an effective interview with the study key informants, four (4) from Council Lingwala Township who works under the Department of solid waste management within the Ministry of Environment, two (2) Environment Protection assistant in charge

of environment, two (2) participants from the local leaders. The researcher was also interview non-governmental organizations (NGOs) that deal with the environment in Lingwala. Four (4) staff member from Lingwala Council who helped for face-to-face interviews and all were successfully interviewed thereby generating a hundred percent (100%) response rate.

3.4 Data Collection Instruments

Three methods were used to collect data for this study: observations, document review, and questionnaires.

3.4.1 Questionnaires

Key stakeholders, such as public servants, commercial sector organizations, local authorities, citizens, and NGOs/CBOs, was given questionnaires. The surveys examined present waste management procedures, obstacles to policy implementation, opinions on the efficacy of policies, and recommendations for enhancements.

3.4.2 Document review

To examine pertinent policies, rules, and reports pertaining to waste management in Kinshasa, a document review was carried out. The National Environmental Policy, the Kinshasa City Solid Waste Management Policy (2018), the Waste Management Regulations, and reports from governmental and non-governmental organizations will all was included. To give context and insights into the current state of affairs, media stories and publications on trash management in Kinshasa was also examined.

3.4.3 Observations

Data on waste collection and disposal procedures, community behavior, and attitudes regarding waste management was gathered through observations of waste management practices in various parts of Kinshasa. The observations recorded the kinds of waste collected, how often it is collected, how it is disposed of, and how the community participates in waste management programs. These tools for gathering data offered a thorough grasp of the intricacies of solid waste management policy in Kinshasa and point out areas in need of development. Recommendations for policy changes, creative waste management solutions, and capacity-building initiatives will be informed by the data collected.

3.5 Data Collection Procedure

3.5.1 Data requirements

The study was carried out using both primary and secondary methods, these were the two methods of data collection that was considered when collecting data for research purposes.

3.5.2 Primary data

To achieve the objectives of the research, the primary data was collected through qualitative research. Hence, for the research primary, data was collected via questionnaires that the researcher administers. The researcher intended to rely more on primary data since the research is about the attitude of people toward the strategies of solid waste management, as it helped the researcher to know more about the reason behind the behavior of the stakeholder's decisions on solid waste management. Moreover, most of the primary data for this research was collected anew and for the first time and thus happen

to be original. For this study, focus group discussions, observations, and questionnaires were used as the sources of primary data.

Questionnaires were sometimes referred to as written interviews and were defined as data generation statistical tools through the use of both open and closed-ended questions which will be pre-written down (Rankin, 2013). These questions may possibly be written down electronically using pre-designed software on paper. The researcher used questionnaires that comprise both open-ended and close-ended questions. The close-ended questions selected a suitable answer for the respondent, which enabled the researcher to quality the responses when analyzing the data later. On the other hand, the open-ended questions were used to supplement the responses on some of the closed-ended questions by allowing the respondent to use their own words and explain in detail. The questionnaires were asked and distributed according to convenience in public places such as charcoal markets, households, and streets depending on the willingness of the participant to respond, following cluster sampling method under probability sampling method which consists in dividing participants into clusters that represent the population.

3.5.3 Secondary data

These were obtained through consulting of the relevant literature that included books, journals, articles, thesis, dissertations, official documents, and internet sources on Solid waste management strategies and DRC solid waste management. This provided a target perspective on the strategies assessment concerning people's way of living and the broad perspective on solid waste management. These sources provided a comprehensive framework on solid waste management strategies as a result of good strategies adopted for some countries like Zambia, Kenya, and China.

3.6 Analysis and Organization of Data

As indicated above, qualitative data will be collected. The qualitative data will be collected and will be coded, collated, sorted, and grouped into similar themes. It will be used in such a way to answer the study's objectives. The data that ensures from the observation method shall be followed by the interpretational method which will be a means to clarify the entire shadow zones that the other data collection methods cannot clearly explain.

3.7 Ethical Considerations

The research was carried out legally and all participants' rights were made known to them. The participants were neither coerced nor exploited during the study and all potential risks were minimized or eliminated to ensure the safety of the participants. The researcher got consent from the city of Kinshasa, the FAO, and the ministry of the environment branch in charge of solid waste management. The data collection was done both in Lingala and French languages that are the most languages spoken in Kinshasa city and there were all available and translated to these various languages.

To uphold the codes of confidentiality and privacy that was required in research ethics, the researcher made sure to eliminate the identification of the participants. No names will be required for each questionnaire respondent hence that would ensure that the identity of the participant were safe and were not be linked to the data collection at any given point, and all recording was done in such a way that the face of participants were hidden.

The process involved giving the research participants a detailed explanation of what the research entails, what was expected of them in terms of the potential risks as well as the potential gains. In this research, the participants were informed about the study through

translated consent letters from the researcher to the appropriate languages that were used in the Democratic Republic of the Congo and they were told to be free to accept or deny without any form of penalty given. The informed consent form clearly explained that the participants could withdraw from the study at any point if they deem it necessary. It was also clearly explained that no form of compensation would be given for their participation. All these activities would be done legally and ethically with permission that would grant by the town hall of the city of Kinshasa.

3.8 Summary

The questionnaire method was very useful in collecting demographic data which cannot be observed without direct involvement with the research participants; while the focus group discussion method was convenient for getting more information that gave the whole research the weight and depth that was needed. The observation method helped in supporting and supplementing the collection of the data through the questionnaires and focus groups and helped to present the data in graph form to give the readers a better understanding of the set-up of the study area. Finally, the secondary data came to make a balance between the findings and the collection of data, as well as give a framework of the existing literature on the subject to give a good direction in the data collection of the present research.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

The previous chapter discussed the methodology used in this study by the researcher. It also described the use of self-administered closed-ended questionnaire for data collection. This chapter presents the research findings. The presentations are based on the study objectives and questions discussed in the first chapter. Before the findings are assessed, the age and gender characteristics of the respondents are described. The educational background of a respondent is often examined in connection with solid waste management.

4.2. Data Presentation and Analysis

4.2.1 Population structure

Table 1below illustrates that of the 60 respondents, 76.7% were men and 23.3% were women. As shown in Table 2, 70.0% of respondents were adults aged over 26 years and 30% of respondents were adults aged between 18 and 25 years. This age group suggests that the majority of respondents had attended school or a university, thus it was presumed that they were knowledgeable about solid waste management as shown on Table 3. Furthermore, 80% of the respondents had a university degree, which enabled them to think critically and react to the survey's questions, as table number three below demonstrates. Therefore, it can be assumed that most of their responses were correct.

Table 1: Gender characteristics of the respondent

GENDER CHARACTERISTICS	FREQUENCY	PERCENTANGES
Male	46	76.7%
Female	14	23.3%
Total	60	100%

Table 2: Age characteristics of the respondent

AGE CHARACTERISTICS	FREQUENCY	PERCENTAGES %
18 - 25 years	18	30%
26 – 35 years	10	16.7%
36 – 45 years	22	36.7%
Over 46 years	10	16.6%
Total	60	100%

Table 3: Education characteristics for the respondent.

EDUCATION CHARACTERISTICS	FREQUENCY	PERCENTAGE %
Secondary	2	3.3%
Tertiary	10	16.7%
University	48	80%
Total	60	100%

4.2.2 Waste management Practices

METHOD	USAGE IN KINSHASA	PERCENTAGE
Incineration	Limited mostly used for medical waste	35%
Composting	Underutilized despite potential for organic waste management	25%
Recycling	Emerging with some private sector initiatives	40%

In addition to the above information the findings also showed that the waste management policy is unknown to 78% of respondents. Ongoing conflicts are seen by 62% as a significant barrier to waste management policy. Corruption is cited by 55% as a major problem. 72% point to inadequate policy execution. 85% have financial difficulties. 70% of rubbish produced by locals is not properly separated. Waste management techniques are superior in low-density suburbs. Poor cooperation among stakeholders and little involvement from the private sector Women's underrepresentation in decision-making.

4.2.3 Sources of solid waste

In Lingwala, 45% of the garbage comes from residential areas, as shown in the pie chart below. Regardless of other sources, such as commercial, institutional, industrial, and municipal, as indicated on the diagram below, waste management policy must focus at the residential level since the results indicate that the majority of waste is produced in domestic settings. During the rainy season, these types of waste absorb a lot of water, which makes them heavier and increases the cost of collection and transportation consequently the policy implemented by local government in regard to collection and

decomposition of these waste becomes ineffective. The area may smell bad as a result of their disintegration, endangering the public's health and the environment. Leather, fabrics, glass, plastics, and other materials are not biodegradable. According to information received from responses, field research, and questionnaire responses, a number of people collect plastics and/or plastic bottles and sell them to companies that recycle these products. According to collectors, a kilogram of these plastic bottles costs between 250 and 300 CDF which is equivalent to $0.13 United States dollars. Further inspection revealed that current strategies in regard to waste disposal do not appreciate waste separation into biodegradable and non-biodegradable categories using special containers or bins as shown on the two pictures below. The combination of resources makes it more difficult to manage solid waste properly. Waste separation is essential to waste management because biodegradable waste can be used to create compost and/or compost manure, recovering resources.

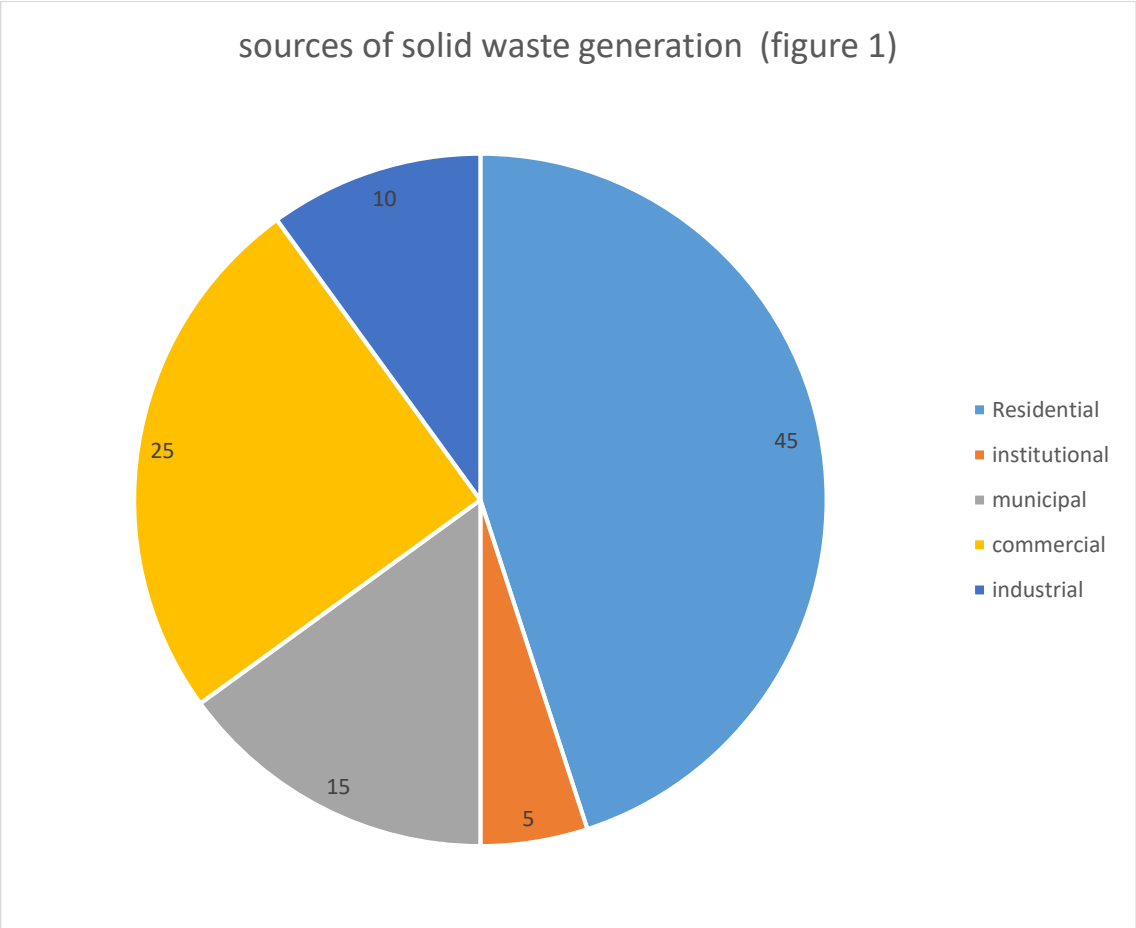


Figure 1: Source of solid waste geretion in Lingwala

Figure 2: Unsegregated solid waste disposed in a residential area of Lingwala

Figure 3: Absence of designated bins for waste separation in Lingwala

4.2.4 Management of final disposal sites and collection frequency

According to questionnaire responses the governance policies in regard to waste management in place dictate how frequently MWSM (municipal waste solid management) systems are effective. Table 4 below shows that 5% of collections take place daily, 20% once a week, and 75% once a month. The data reveal three different collecting frequencies. In order to determine the optimal frequency of collection that would ensure resource optimization, effective routes, and economic feasibility, it is imperative to confer with solid waste producers.

Table 4: Frequency of waste collection

Everyday	5%
Once a week	20%
Once a month	75%
Total	100%

The government of DR Congo via local government tried to privatize waste management and disposal in a bid to improve efficiency of waste management and disposal. As a result, the final disposal locations in Lingwala are frequently overseen by both the public and private sectors. Only 15% of the sites are managed by the private sector, 40% are under municipal authority, and 45% are co-managed by both, private sector and municipal authority. Consequently, the findings imply that municipalities have recruited the private sector to co-manage final disposal sites in order to alleviate problems that occur there for a number of reasons, including budgetary limitations. The results indicate that the private

sector's involvement in the exclusive management of ultimate disposal sites is comparatively minimal.

4.2.5 Institutional role in the governance of municipal solid waste

The management policy of municipal solid waste involves a number of stakeholders. Most of these are academic, corporate, and public institutions. A critical understanding of the many roles, contributions, and levels of involvement is necessary for sustainable municipal solid waste policies. This study found that implementing waste management policies was the main organizational role of the public sector. As a result, they comprise 35% of the sample population, or 60%. On the other hand, academia, which is supposed to establish the research agenda, only made up 2% of those involved in the governance of municipal solid waste. The results indicate a lack of MSWM research in Lingwala, which ultimately impacts anemia's capacity to make recommendations based on factual information. Despite the paucity of research on the institutional role in municipal solid waste governance, the UNEP (2023) paper harnessing the Role of Private Sector in Waste Management via South-South and Triangular Cooperation for Inclusive Urbanization promotes the business sector's involvement in updating waste management policies and putting into practice sustainable trash reduction and recovery plans. The fiscal priorities and technical skills of the implementing policies, the municipalities, have a significant impact on the governance of municipal solid waste. According to the report, one of the issues with Lingwala's municipal solid waste management governance procedures is the lack of technical capacity to create and administer regulations and policies. The findings also demonstrated the absence of financial priority in the country's municipal solid waste governance. Michel and Keng's (2018) study, which emphasized the importance of

technical expertise and capability in the selection and use of appropriate SWM technologies, supports these conclusions. Subsequently, Smangele, Mulala, and Nzalalemba (2019) discovered that municipalities can lack the technical expertise to implement advanced planning procedures, waste management policies and technologies, and data analysis techniques. Later, Delufa et al. (2022) confirmed this viewpoint in their study, which also noted low technological skills as a significant obstacle that led to insufficient disposal techniques and ineffective waste management policy.

4.2.6 Waste management policy in Lingwala

The research findings show that the people of Lingwala are aware of the three waste management policy though poorly implemented, these are waste management regulations, recycling incentives, incineration, composting and public education campaigns. Municipal authority of Lingwala has numerous national and municipal environmental and SWM laws and regulations, according to the review's results. For example, constitution encourages public participation in environmental management, conservation, and protection and in the same vain, Constitution assures everyone the right to a clean and healthy environment. Similarly, a just and cohesive community that gains from equitable social development in a clean and safe environment is essential. In order to promote sustainable SWM in Lingwala and guarantee that everyone lives in a safe, secure, and healthy environment, the National Solid Waste Management Strategy 2014 was developed. The approach is based on adhering to current legislative frameworks, including the Congolese Constitution, the Environmental Management and Coordination Act (EMCA), and the Environmental Management and Coordination (Waste Management) Regulations of 2006. In order to assist governments in implementing ecologically

acceptable SWM policies, the plan lays out 13 basic standards for waste collection, transportation, disposal, and licensing that all municipal authorities should adhere to (NEMA, 2014). Additionally, it outlined several waste management goals and tactics, like strategic alignment and partner recognition through public-private partnerships. However, it is unclear who the expected partners are and whether they include members of the informal sector, especially women and other vulnerable people who are crucial to the SWM chain and typically face the brunt of poor SWM-related risks. Waste management policy requires a well-thought-out and supported waste policy. According to UNEP, one element that most waste policies have in common is a waste hierarchy. This hierarchy is a systematic approach to waste management in the order of environmental priority for different waste management techniques, as can be seen in the waste pyramid below.

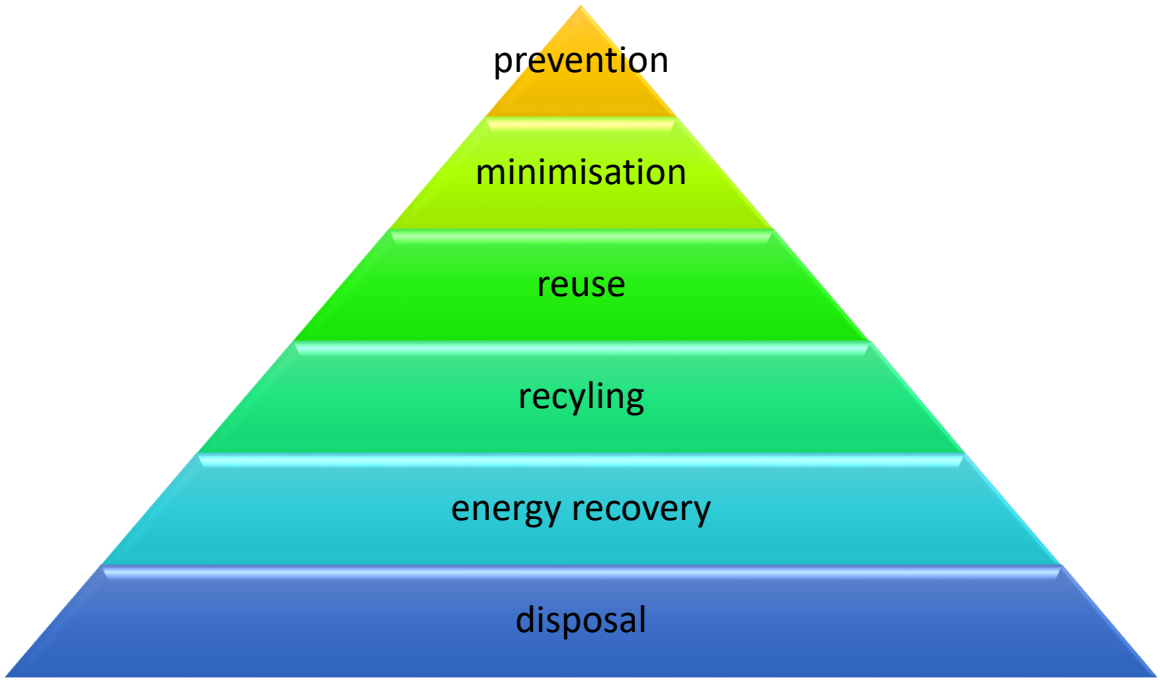


Figure 4: The waste hierarchy

The findings also indicate that Public education initiatives is another essential policy tactic for encouraging waste management. These programs can help raise public awareness of the need of trash reduction and the steps that businesses and individuals can take to reduce waste. They can also provide information about the benefits of cutting waste and how trash impacts the environment. This policy is poorly implemented in Lingwala. For example, an ad might highlight how recycling one aluminum can save enough energy to run a television for three hours. By making this information easily available, governments may encourage citizens to reduce waste. Furthermore, the findings also indicate that municipality of Lingwala has also poorly implemented recycling incentives policy. By providing incentives for recycling, governments can encourage the decrease of waste. These can take many different forms, such cash incentives for people who return recyclables to specified pickup locations or tax advantages for companies that recycle a specific portion of their waste. Governments can reduce the amount of waste that ends up in landfills by encouraging businesses and individuals to recycle more of their waste by offering financial incentives

4.2.7 Challenges associated with the current solid waste management policy

The main obstacles to waste management policy are as follows, in well-established metropolitan townships with infrastructure, curbside waste management policy like collection of waste by municipal vehicles are feasible and helpful nevertheless, these are not acceptable in rural and informal areas. In informal settlements, policy is hampered by poor access and a lack of roadways within the neighborhoods. Because standard collection vehicles (compactors) cannot reach individual residences in these places, it is consequently difficult to offer an individual household service. Additionally, the lack of

property ownership and title restricts towns' collection budgets because rates are rarely collected in these areas (Kombe 1997). There is no regulation for the number of black bags and collection containers provided. Municipalities are increasingly using wheelie bins for residential collection. However, this poses a unique set of challenges because they require particular handling equipment and regular cleaning. When creating a solid waste policy, consideration should be given to proper waste generation, segregation, collection, transportation, and disposal methods, landfill management, hazardous and other toxic material management, treatment, incineration, recycling, and other technology standards, monitoring, evaluation, and other aspects of solid waste management. Methods for continuous advancement. Funding sources, the roles of many stakeholders, and the immediate and long-term economic, environmental, and social costs and benefits must all be considered in policy. However, this study has demonstrated that ineffective waste management techniques are caused by a shortage of staff in community groups and waste management officers, inadequate infrastructure, and financial constraints. The results also indicate that allowing local governments to set waste management policies has long been the norm in Lingwala. After solid waste was identified as an environmental problem, policymakers were more likely to recognize that, similar to other environmental challenges, the effects of solid waste often transcend beyond local political authorities. Before this, it made sense to base policy decisions on local health consequences and disposal. Additionally, as the cost of solid waste management increased, so did the need for funding from higher governmental levels. At the close of the 20th century, the movement toward privatization which is not a unique method to solid waste management saw a resurgence in popularity. The importance of private business firms in solid waste management was reinforced by legislative hostility toward command-and-control

regulatory systems and the legal system's portrayal of solid waste management as a commercial activity rather than a health and welfare concern.

4.3 Discussion and Interpretation

The study's findings paint a bleak picture of garbage management in Lingwala, Kinshasa, the Democratic Republic of the Congo, highlighting a complex web of barriers to effective waste management strategies. 78% of respondents were shockingly ignorant about waste management policies, which is a depressing reminder of the government's failure to give its people vital information. This knowledge gap is caused by a number of causes, including inadequate environmental education programs, limited information availability, and pervasive poverty that forces people to prioritize daily survival over environmental concerns (Law No. 11/2002 of 2002, Article 5). The ongoing hostilities in the nation have made matters worse by damaging infrastructure and interfering with trash collection services, making citizens grimace and deal with waste in unsanitary conditions. The municipality's financial constraints account for 85% of Lingwala's poor waste management situation. Due to a lack of funding, just 20% of the city's estimated 6,000 tons of trash are collected every day, resulting in subpar garbage collection and disposal services (World Bank, 2020). Because of this, there are currently a number of open dumpsites that pose a health risk to the surrounding population. Trash management and financial constraints are closely related, garbage management systems fail and the environment suffers when there is insufficient funding. The Environmental Framework Law (Law No. 11/2002 of 2002, Article 10) requires the government to allocate sufficient finances for environmental management, although this hasn't been done. Another major barrier to efficient waste management policies in Lingwala is corruption, which was

mentioned as a major difficulty by 55% of respondents. Trash management initiatives have not been implemented due to the misappropriation of monies intended for trash management, and ineffective service delivery has resulted from the lack of openness in the awarding of waste management contracts. There is a clear connection between waste management policy and corruption, corruption encourages inefficiency, which has a negative impact on the environment. Transparency and accountability in environmental decision-making are mandated by Decree No. 14/019 (2014) on Environmental and Social Impact Assessment (ESIA) procedures, although this has not been implemented. Another major issue facing Lingwala is the inadequate execution of waste management policies (72%) of the respondents indicated this issue. Waste management regulations now only exist on paper due to a lack of clear guidelines, insufficient institutional capability, and ineffective enforcement mechanisms. A culture of impunity has resulted from the failure to enforce the Environmental Liability Law (Law No. 12/2002 of 2002, Article 5), which holds people and organizations responsible for environmental harm. The low quality of waste management in Lingwala is caused by a number of issues in addition to these difficulties. Unplanned trash disposal and the growth of informal settlements are results of the strain that rapid urbanization has placed on the infrastructure already in place. Effective waste management has also been hampered by a shortage of qualified workers and insufficient technology. Waste management is now viewed as a low priority due to the government's reluctance to prioritize it, which has deterred investment in the industry. The situation in Lingwala is a prime example of environmental injustice, with the most vulnerable sections of society suffering the most as a result of inadequate waste management techniques. The environment is being destroyed and citizens' health is in danger as a result of the government's delay and lack of commitment to environmental

management. Another important discovery is the variation in waste management strategies among suburbs. Better waste management techniques, such as routine garbage collection and appropriate disposal, are seen in low-density areas, which are frequently associated with greater socioeconomic level. On the other hand, poor garbage collection services in high-density areas which are frequently home to low-income households lead to the growth of open dumpsites and environmental deterioration. This discrepancy emphasizes the necessity of customized approaches that take into account the particular requirements and difficulties faced by various communities in Lingwala. One major omission in present processes is the absence of waste separation at the source. Effective separation techniques are essential for lowering waste volumes, encouraging recycling, and minimizing environmental effects because residents are thought to contribute 45% of the waste. The lack of such procedures, however, points to a more serious problem with waste management education and infrastructure. Policies and regulations, which are beneficial at the national level, are not transferring to local accomplishments, according to respondents, suggesting a gap in implementation and enforcement. Another crucial problem is the lack of significant collaborations with the private sector. Although private sector involvement can contribute knowledge, resources, and creative waste management policies, the absence of such alliances points to a lost chance for cooperation and funding. Respondents pointed to a more general problem of accountability and group responsibility by pointing out a lack of cooperation from organizations, people, and businesses. This lack of collaboration is especially troubling since it makes it more difficult to handle the waste management issue and advance sustainable practices. One important finding is the underrepresentation of women in waste management policy decision-making processes. In households, women are frequently the primary trash managers. They are in charge of

handling household waste, teaching kids about waste management, and supporting community-level projects. Their exclusion from decision-making processes, however, probably results in policies that don't adequately take into account local perspectives or community requirements. This is especially troubling because women's involvement in trash management can lead to more effective and inclusive policy. A system that requires a thorough overhaul is depicted by the interaction of these elements, which include a lack of separation, insufficient infrastructure, little involvement from the private sector, poor cooperation, and gender imbalance in decision-making. A holistic strategy that prioritizes diversity, community involvement, and sustainable practices is needed to address these problems. This can include programs like public education campaigns, community-led waste management projects, and collaborations with businesses in the private sector to encourage recycling, reuse, and trash reduction. The creation of inclusive and successful policies that take into account the particular requirements and difficulties of various communities must also be given top priority by legislators. This can include programs like community-based waste collection services, decentralized waste management systems, and social enterprises that encourage recycling and reuse of waste. Additionally, initiatives to increase women's involvement in waste management policy decision-making processes can guarantee that policies are more responsive to community needs and foster more fair and sustainable results. In conclusion, Lingwala, Kinshasa, Democratic Republic of the Congo's waste management challenge is a complicated problem that calls for an all-encompassing and varied solution. In order to promote efficient waste management methods and lower threats to the environment and human health, it is imperative to address issues such as lack of separation, insufficient infrastructure, limited private sector engagement, poor coordination, and gender imbalance in decision-making.

Policymakers can guarantee a more sustainable future for Lingwala and its populations by emphasizing community involvement, inclusivity, and sustainable practices. To solve these issues and guarantee efficient waste management procedures in Lingwala, the government must act immediately. This can be accomplished by boosting institutional capacity, encouraging community involvement and engagement, and increasing financing for waste management.

Additionally, the government must take action to combat corruption and guarantee accountability and transparency in environmental decision-making. The successful implementation of the Kinshasa City Solid Waste Management Policy (2018) requires a multi-faceted approach that involves government agencies, private sector entities, communities, and other stakeholders. The following crucial areas should be the main emphasis of the implementation strategy allocation of sufficient funds, user fees and charges, private sector investment, development partners just but to mention a few.

4.4 Summary

This chapter mainly covered the findings of this research these are the highlights of this chapter 78% of respondents said they were unaware of the trash management policy. 62% of respondents believe that ongoing conflicts are a major obstacle to waste management. 55% of respondents list corruption as a serious issue. Inadequate policy execution is indicated by 72%. 85% struggle financially. 70% of the trash generated by residents is improperly sorted. Low-density suburbs have better waste management practices. Insufficient collaboration between stakeholders and minimal participation from the private sector the underrepresentation of women in decision-making. The survey also found inadequate waste management practices, such as insufficient incineration,

underutilized composting, and novel recycling. Seventy percent of the rubbish is produced by residents, yet inadequate waste separation at the source leads to uncontrolled waste type mixing and serious health and environmental issues. Institutional problems also plague Lingwala's waste management. Financial constraints, minimal private sector participation, corruption, and insufficient stakeholder cooperation were identified as the primary obstacles. Women are also underrepresented in decision-making processes, despite their vital role in reducing household trash and promoting community-level initiatives. Lingwala’s legislative framework for garbage disposal is made up of the Environmental Framework Law, Environmental Liability Law, and Decree No. 14/019 (2014).

CHAPTER 5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides an overview of the major study findings, conclusions, recommendations and suggestions in relation to the following research questions, what are the strategies of solid waste management in Lingwala, Kinshasa? What is the effectiveness of solid waste management strategies in Lingwala, Kinshasa? What challenges affect the implementation of solid waste management in Lingwala, Kinshasa? What are the policies to ensure proper solid waste management in Lingwala, Kinshasa?

5.2 Discussion

This study examined the solid waste management strategy of Lingwala, Kinshasa, Democratic Republic of the Congo, with an emphasis on determining the tactics being employed, assessing their efficacy, and identifying the primary obstacles encountered in putting these policies into practice. The research subject was presented in Chapter 1, emphasizing the importance of efficient solid waste management policies in metropolitan settings in Lingwala, Kinshasa, Democratic Republic of the Congo. The chapter described the goals of the study, which included analyzing Lingwala's solid waste management policy, identifying the tactics being employed, assessing their efficacy, and determining the primary obstacles to these policies' implementation. The literature review on solid waste management was evaluated in Chapter 2, which covered subjects like the significance of solid waste management, common strategies for solid waste management, and the difficulties developing nations experience in putting into practice efficient solid waste management policies. The chapter also looked at the DR Congo's solid waste management legislation, which includes the Environmental Framework Law and the

Environmental Liability Law. The research methodology, which used a qualitative data gathering and analysis techniques, was described in Chapter 3. The study area, sampling plan, data gathering methodologies, and data analysis methods were all covered in this chapter. The study's results, which were reported in Chapter 4, showed that Lingwala uses a variety of solid waste management techniques, such as underutilized composting, restricted incineration, and new recycling programs. However, due to insufficient infrastructure, poor enforcement of regulations, and inadequate waste separation, these initiatives are mainly ineffectual. The chapter also discussed the difficulties in putting solid waste management policies into practice, such as low awareness, financial limitations, corruption, and little involvement from the corporate sector.

5.3 Conclusion

To conclude this research paper, the research has noted a worrisome picture of inadequacy and inefficiency is painted by the assessment of Lingwala, Kinshasa, Democratic Republic of the Congo's solid waste management policy. The municipal handles solid waste in a number of ways, including new recycling initiatives, limited incineration, and underutilized composting. However, these attempts are largely ineffective because of inadequate infrastructure, lake enforcement of regulations, and inadequate waste separation. The study reveals that 78% of respondents are ignorant about waste management policies, and 72% of respondents point to insufficient policy implementation, underscoring the critical need for attention. A number of issues, such as limited private sector involvement, financial limitations, and corruption, make these tactics less effective. The survey also discovered that, although playing a critical role in home trash management, women are underrepresented in decision-making processes.

Additionally, there is a legal framework for waste management, but it is not enforced, which results in unregulated waste type mixing and poses major threats to the environment and human health. Uncontrolled trash disposal also aggravates flooding, contaminates water sources, and spreads illness. An all-encompassing strategy is required to guarantee appropriate solid waste management in Lingwala. This includes developing and enforcing a comprehensive solid waste management policy, increasing awareness and education, strengthening institutional capacity, encouraging private sector engagement, and promoting community participation. Recyclables and organic trash should be the main focus of efficient waste separation systems that are put in place at the source. Lingwala may move toward a more sustainable and efficient solid waste management system, safeguarding the environment, public health, and the future of the town, by tackling these issues and putting these policy recommendations into practice. In the end, this calls for a persistent commitment from the public, commercial, and civil society sectors to give solid waste management top priority and cooperate to achieve a shared objective.

5.4 Summary

The primary objective of the study was to assess the solid waste management policy in Lingwala Municipality. The research approach was guided by research objectives, which comprised questions, and this study was mainly qualitative in character. The major findings of this qualitative research is that, there is no evidence that these policy components were implemented; this is probably due to a poor policy implementation culture. For example, the qualitative data analysis reveals that Lingwala's waste management sector is plagued by the inadequate implementation and enforcement of SWM legislation and regulations. In reality, in addition to having a poor enforcement

culture, community members feel that the existing frameworks and legislation are not clear enough to direct the country's SWM future. Participants from the community and the government largely concur that Lingwala faces substantial challenges in implementing SWM policy, even though gender and life-course-specific issues were not discussed in the qualitative study. The primary obstacles to the execution of policies, according to the survey participants, are corruption, a lack of political will, political meddling, and a lack of public involvement. These difficulties affect how SWM policies are implemented both nationally and locally. This clearly shows that, despite the explicit mention of gender and life cycle in SWM policies, the poor implementation culture may make it difficult for residents to benefit from such policies. The dispute noted above suggests that merely developing a legislative framework or policy is not enough; operationalizing such a policy necessitates the will, especially political will. It is enough to say that there are gaps between policy formulation and execution in many low- and middle-income countries (Okoroma 2006, Makinde 2005). The policy provisions were found to be ambiguous in the majority of the documents that were evaluated. Rather, policy papers usually include general and wide information. However, many international organizations, protocols, and conventions have emphasized that specific gender and life-course policies must be incorporated into environmental management frameworks in order to support sustainable development (UNDESA, 1992, UN, 1995, AU, 2003; Lawyers Circle and Oxfam, 2014).

5.5 Recommendation

The analysis shows that the current policies for managing municipal solid waste are insufficient, chaotic, and unsustainable. The whole municipal solid waste management

value chain in Lingwala lacks viable financing mechanisms. Below are the recommendations

- Create a Comprehensive Policy: Create and implement a comprehensive solid waste management policy that covers the production, collection, transportation, and disposal of trash.
- Boost Education and Awareness: Start public awareness efforts to inform locals about appropriate trash management procedures and legal obligations.
- Boost Institutional Capacity: Give waste management authority funding and training to enhance monitoring and enforcement.
- Encourage Private Sector Involvement: Encourage private sector funding for services and infrastructure related to trash management.
- Encourage Community Involvement: Include communities—including women—in the formulation and execution of waste management policies.
- Enhance Waste Separation: Put in place efficient waste separation systems at the source, paying particular attention to organic waste and recyclables.
- Strengthen Enforcement Systems: Enforce waste management laws more strictly and penalize noncompliance.

5.6 Suggestion for further research study

1. Decentralized Waste Management: Assess the feasibility and effectiveness of various decentralized waste management options, including community-led recycling and composting initiatives.

2. Cost-Benefit Analysis: Consider the creation of jobs, income, and environmental savings while analyzing the financial benefits and drawbacks of implementing effective solid waste management systems in Lingwala, Kinshasa, DRC.
3. Community-Based Approaches: Assess the effectiveness of community-based waste management initiatives, paying particular attention to the role that local leaders, youth organizations, and women's organizations play in promoting recycling, reuse, and trash reduction.
4. Waste-to-Energy Potential: Assess how waste-to-energy technologies, including biogas production or incineration, may reduce trash amounts and provide energy in Lingwala.

Reference

Abdoli, M., Rezaee, M., & Hasanian, H. (2016). Integrated solid waste management in megacities. *Global Journal of Environmental Science and Management.*

Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., Alshihri, F. S., Alshammari, M. S., Ahmed, S. M. S., Al-Gehlani, W. A. G., & Alrawaf, T. I. (2022). Environmental sustainability impacts of solid waste management practices in the Global South. *International Journal of Environmental Research and Public Health, 19(*19), 12717. https://doi.org/10.3390/ijerph191912717

African Development Bank. (2019). *Democratic Republic of Congo: Country strategy paper 2019-2023*.

Alam, P., & Ahmade, K. (2013). Impact of Solid Waste on Health and the Environment.

Alchemer (2021). *Purposive sampling 101*. Retrieved from https://www.alchemer.com/resources/blog/purposive-sampling-101/

Awuchi, C. (2017). Industrial waste management: Brief survey and advice to cottage, small and medium-scale industries in DRC. *International Journal of Advanced Academic Research, 3*, 26-43.

Aziz, S. Q., Othman, S., & Omar, I. A. (2019). Recyclable Solid Waste Materials Management in Erbil City, Iraq. *8,* 57-62.

Ballados, M. T. (2010). *Assessing the Solid Waste Management Practices in Bacolod City, Philippines.*

Banacu, C. S., Zechuru, V., & Olaru, B. G. (2016). Project management in organic waste recycling.

Bhupathi, P.A., & Ravi, G.R. (2017). Comprehensive Format of Informed Consent in research and practice: A tool to uphold the ethical and moral standards.

Blumberg, L., & Gottlieb, R. (1989). *War on waste: Can America win Its battle with garbage?* Washington, DC: Island Press.

Chengula, A., Lucas, B. K., & Mzula, A. (2015), Assessing the awareness, knowledge, attitudes and practices of the community towards solid waste disposal in Morogoro Municipality, Tanzania

Democratic Republic of Congo. (2002). *Law No. 11/2002 on environmental framework Law*.

Democratic Republic of Congo. (2002). *Law No. 12/2002 on environmental liability law*.

Democratic Republic of Congo. (2014). *Decree No. 14/019 on environmental and social impact assessment procedures.*

Dworkin, S. L. (2012). Sample size policy for qualitative studies using in-depth interviews. *Archives for Sexual Behavior*, *41*, 1319-1320.

Grant, C., & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research. *Administrative Issues Journal*, *4*(2), 502-560. https://doi.org/10.5929/2014.4.2.9.

Government of India. (2003). *Report of the technology advisory group on solid waste management*.

GreenChoices. (n.d.). Environmental impacts of waste recyclings. https://www.greenchoices.org/green-living/waste-recycling/environmental-impacts

Hickman, H. L. (2003). *American alchemy: The history of solid waste management in the United States*. Forester Communications.

Hoornweg, D., & Thomas, L. (1999). *What a waste: Solid waste management in Asia*. World Bank. http://documents.worldbank.org/curated/en/694561468770664233/What-a-waste-solid-waste-management-in-Asia.

Jackson, R. L., Drummond, D. K., & Camara, S. (2007). What is qualitative research? *Qualitative Research Report in Communication, 8*(1), 21-28.

Jerie, S. (2006). Analysis of institutional solid waste management in Gweru, Zimbabwe. *Eastern Africa Social Science Research Review*, *22*(1), 103–125. https://doi.org/10.1353/eas.2006.0004

Jerie, S., & Tevera, D. (2014). Solid waste management practices in the informal sector of Gweru, Zimbabwe. *Journal of Waste Management*, 1–7. http://dx.doi.org/10.1155/2014/148248

Joseph, K. (2006). Stakeholder participation for sustainable waste management. *Habitat International*, *30*(4), 863-871.

Kafando, P., Segda, B. G., Nzihou, J. F., & Koulidiati, J. (2013). Environmental impacts of waste Management deficiencies and health issues in Burkina Faso.

Khan, S., & Farooqi, I. H. (2012). Prioritising municipal solid waste management factors in India. *International Journal of Environment and Waste Management*, *10*(4), 423–440. https://doi.org/10.1504/IJEWM.2012.049821

Kulbir, S.S. (2002). *Methodology of research in education*, Sterling Publishers.

Links, J. M. (2006). Municipal, industrial and hazardous waste. Johns Hopkins University.

Luton, L S. (1996). *The politics of garbage: A community perspective on solid waste policy making*. University of Pittsburgh Press.

Madrigal, D. V. (2018). Solid waste management awareness, attitude, and practices in a Philippine Catholic higher education institution.

Mafume, P. N., Zendera W., Mutetwa, M., & Musimbo, N. (2016). Challenges of solid waste management in Zimbabwe. *Journal of Environement and Waste Management.*

Maluluke, P. H. (2014). *A review of solid waste management practices in Polokwane City* (Master's thesis, University of South Africa).

Mandevere, B. (2016). *An investigation into the effectiveness of household solid waste management strategies in Harare, Zimbabwe.* (Master's thesis).

Melosi, M. V. (2005). *Garbage in the cities: Refuse, reform, and the environment* (Rev. ed.). University of Pittsburgh Press.

Ministry of Environment and Sustainable Development. (2015). *National Environmental Policy.*

Munikwa, S., & Dondo, B. (2014). *A Study of the Level of Awareness and Practices of Solid Waste Management.*

Ndum, A. E. (2013). *Bottom-up approach to sustainable solid waste management in African countries* (Doctoral dissertation, University of Technology, Cottbus).

Noble, H., & Heale, R. (2019). Triangulation in Research. *Evidence-Based Nursing, 22*(3), 67-68.

Noonjiyil Kaithery, N., & Karunakaran, U. (2019). Study on attitude of household waste management in Kerala. *International Journal of Community Medicine and Public Health. 6,* 2095. https://doi.org/10.18203/2394-6040.ijcmph20191826

Pembelajaran UKM. (2010). A Study on the Knowledge, Attitudes, Awareness Status and Behaviour Concerning Solid Waste.

Prüss, A., Giroult, E., & Rushbrook, P. (1999). *Safe management of wastes from health-care activities.* World Health Organization.

Saley, J. B. (2012). Sadanga enacts on solid waste management. *SunStar Baguio*.

Tadakuluru, S. (2021). *Introduction to sampling techniques*. https://www.mygreatlearning.com/blog/introduction-to-sampling-techniques/

Udayangani, K., Dilanthi, A., Richard, H., & Raufdeen, R. (2006). Attitudes and perceptions of construction workforce on construction waste in Sri Lanka. *Management of Environmental Quality, 17*(1), 57-72.

United Nations Environment Programme. (2018). *Waste Management in the Democratic Republic of Congo.*

World Bank. (2020). *Democratic Republic of Congo: Environmental Management and Climate Change.*

World Health Organization. (2018). *Waste Management in the Democratic Republic of Congo: A Review of the Current Situation.*

World Health Organization. (2011). Vector-borne disease. http://www.google.com.ph/search?q=diseases+that+human+can+get+due+to+mismanagement+of+wastes&btnG=Hanapin&hl=tl&source=hp&rlz=1R2ADFA_enPH392&aq=f&aqi&aql&oq

APPENDICES

Appendix 1: QUESTIONAIRES Guide (English and French)

Africa University, [A.U]

(A United Methodist-Related Institution)

Date.../..../ 2026

To Whom It May Concern

Dear Sir/Madam

Introduction

My name is OKITO SALUMU MARCEL, a student at Africa University studying. DEGREE MASTER IN PUBLIC POLICY AND GOVERNANCE in the COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES. I will be carrying out A STUDY ON AN ASSESSMENT OF SOLID WASTE MANAGEMENT IN LINGWALA, KINSHASA, DEMOCRATIC REPUBLIC OF THE CONGO

I gently ask for your contributions in providing your ideas and views through completing the questionnaire- attached to this document. All information provided shall be confidential and will be used only for academic purposes. Your role will assist in success of this research. No names or information of the participants will be published. You should acquire more detail and information about the researcher, and you may contact my research supervisor and your participation will be greatly appreciated.

Section A: Demographics

1. Gender: ☐ Male ☐ Female
2. Age: ☐ 18–25 ☐ 26–35 ☐ 36–45 ☐ 46+
3. Occupation:…….

Section B: Informants Interview questionnaires

1. Can you describe the main solid waste management strategies currently implemented in Lingwala?
2. How are these strategies planned, coordinated, and implemented at the municipal level?
3. In your view, how effective are the current solid waste management strategies in Lingwala?
4. What evidence or indicators do you use to determine whether these strategies are working effectively?
5. What challenges or limitations affect the effectiveness of these strategies?
6. What are the main factors contributing to the current waste management situation in Lingwala?
7. What recommendations do you suggest to improve waste management in Lingwala?

In French:

À qui de droit

Madame, Monsieur,

Introduction

Je me nomme OKITO SALUMU MARCEL, étudiant à Africa University, poursuivant un MASTER EN POLITIQUES PUBLIQUES ET GOUVERNANCE AU SEIN DU COLLÈGE DES SCIENCES DE GESTION ET DE MANAGEMENT. Dans le cadre de mes études, je mène une recherche intitulée: ÉVALUATION DE LA GESTION DES DÉCHETS SOLIDES À LINGWALA, KINSHASA, EN RÉPUBLIQUE DÉMOCRATIQUE DU CONGO. Je sollicite respectueusement votre contribution en partageant vos idées et points de vue à travers le questionnaire ci-joint. Toutes les informations fournies resteront strictement confidentielles et seront utilisées uniquement à des fins académiques. Votre participation contribuera grandement à la réussite de cette recherche. Aucun nom ni aucune information personnelle des participants ne sera publié.

Pour toute information complémentaire concernant cette étude, vous pouvez contacter mon encadrant de recherche. Votre participation sera vivement appréciée.

Section A: Information démographiques:

Sexe: ☐ Masculin ☐ Féminin

Âge: ☐ 18–25 ☐ 26–35 ☐ 36–45 ☐ 46+

Profession: …….

Section B: Questionnaire d'entretien des informateurs

1. Pouvez-vous décrire les principales stratégies de gestion des déchets solides actuellement mises en œuvre à Lingwala?

2. Comment ces stratégies sont-elles planifiées, coordonnées et mises en œuvre au niveau municipal?
3. Selon vous, dans quelle mesure les stratégies actuelles de gestion des déchets solides à Lingwala sont-elles efficaces?
4. Quels éléments de preuve ou indicateurs utilisez-vous pour déterminer si ces stratégies fonctionnent efficacement?
5. Quels défis ou limites affectent l'efficacité de ces stratégies?
6. Quels sont les principaux facteurs contribuant à la situation actuelle de la gestion des déchets à Lingwala?
7. Quelles recommandations proposez-vous pour améliorer la gestion des déchets à Lingwala?

Appendix 2: INFORMED CONSENT GUIDE

Identify yourself

My name is OKITO SALUMU MARCEL, a final year Master in Public Policy and Governance student from AU. I am carrying out a study on AN ASSESSMENT OF SOLID WASTE MANAGEMENT IN LINGWALA, KINSHASA, DEMOCRATIC REPUBLIC OF THE CONGO. You are free to decline to answer any question at any time during the interview process. I am kindly asking you to participate in this study by answering the question attached.

What you should know about the study:

Purpose of the study:

The purpose of the study is to assess to assess the effectiveness of the current policy on solid waste management in the Democratic Republic of the Congo in Lingwala, Kinshasa.

Procedures and duration

If you decide to participate you will answer the questions attached. It is expected that this will take about 20 to 30 minutes.

Risks and discomforts

I am aware that you may not have done this before, but it is not a difficult task. Your response will not be published and nobody else will know about it. I am also aware of your time might be affected, therefore you can fill it at your own free time.

Benefits and/or compensation

There are no financial benefits or compensation for participants. However, your esteemed participation is highly appreciated.

Confidentiality

This study is guided by ethics and confidentiality, therefore, names are not needed unless you feel free to disclose, and in any case should I need to, I will seek your permission first.

Voluntary participation

Participation in this study is voluntary. If you decide to participate in this study, your decision will not affect your future relationship within your township or any other person. If you chose not to participate, you are still free to withdraw your consent and to discontinue participation without penalty.

Offer to answer questions

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

Authorisation

If you have decided to participate in this study, please sign this form in the space provide below as an indication that you have read and understood the information provided above and have agreed to participate.

---------- ----------

Name of Research Participant (please print) Date

Signature of Research Participant or legally authorised representative

If you have any questions concerning this study or consent form beyond those answered by the researcher including questions about the research, your rights as a research participant, or if you feel that you have been treated unfairly and would like to talk to someone other than the researcher, please feel free to contact the Africa University Research Ethics Committeeon telephone (020) 60075 or 60026 extension 1156 email aurec@africau.edu

Name of Researcher: ----------

FRENCH

GUIDE DE CONSENTEMENT INFORMÉ

Identification du chercheur

Je me nomme OKITO SALUMU MARCEL, étudiant en dernière année de MASTER EN POLITIQUES PUBLIQUES ET GOUVERNANCE À AFRICA UNIVERSITY. Je mène une étude intitulée: ÉVALUATION DE LA GESTION DES DÉCHETS SOLIDES À LINGWALA, KINSHASA, EN RÉPUBLIQUE DÉMOCRATIQUE DU CONGO. Vous êtes libre de refuser de répondre à toute question à tout moment au cours du processus d'entretien. Je vous demande gentiment de participer à cette étude en répondant au questionnaire ci-joint.

Informations importantes concernant l'étude

But de l'étude

Le but de cette étude est d'évaluer l'efficacité de la politique actuelle de gestion des déchets solides en République Démocratique du Congo dans le commune de Lingwala, Kinshasa.

Procédures et durée

Si vous acceptez de participer, vous devrez répondre aux questions ci-jointes. Cette activité devrait prendre environ 20 à 30 minutes de votre temps.

Risques et inconforts

Je suis conscient que vous n'avez peut-être jamais participé à ce type d'étude auparavant, mais il ne s'agit pas d'une tâche difficile. Vos réponses ne seront pas publiées et resteront confidentielles. Je suis également conscient que votre temps peut être sollicité; vous êtes donc libre de remplir ce questionnaire au moment qui vous convient.

Avantages et/ou Rémunération

Il n'y a aucun avantage financier ni compensation pour votre participantions. Toutefois, votre précieuse participation est grandement appréciée.

Confidentialité

Cette étude est menée dans le respect des principes éthiques et de la confidentialité. Par conséquent, les noms ne sont pas requis, sauf si vous souhaitez les fournir volontairement. Dans tous les cas, si cela s'avérait nécessaire, votre autorisation vous sera demandée au préalable.

Participation volontaire

La participation à cette étude est entièrement volontaire. Si vous choisissez d'y participer, votre décision n'affectera en rien vos relations futures au sein de votre communauté ou avec toute autre personne. Si vous décidez de ne pas participer, vous êtes libre de retirer votre consentement et d'interrompre votre participation à tout moment, sans aucune conséquence.

Proposer de répondre aux questions

Avant de signer ce formulaire, veuillez poser toute question concernant les aspects de cette étude qui ne vous sembleraient pas clairs. Vous pouvez prendre tout le temps nécessaire pour réfléchir avant de prendre votre décision.

Autorisation

Si vous acceptez de participer à cette étude, veuillez signer ce formulaire dans l'espace prévu ci-dessous afin d'indiquer que vous avez lu et compris les informations ci-dessus et que vous consentez à participer.

---------- ----------

Nom du participant à la recherché (veuillez écrire en lettres moulées) Date

---

Signature du participant à la recherche ou de son représentant légalement authorisé

Si vous avez des questions concernant cette étude ou le formulaire de consentement au-delà de celles auxquelles le chercheur a répondu, y compris des questions sur la recherche, vos droits en tant que participant à la recherche, ou si vous estimez avoir été traité de manière injuste et souhaitez de parler avec une autre personne que le chercheur, vous pouvez contacter le Comité d'éthique de la recherche de Africa University au téléphone: (020) 60075 ou 60026, poste 1156, ou par e-mail aurec@africau.edu

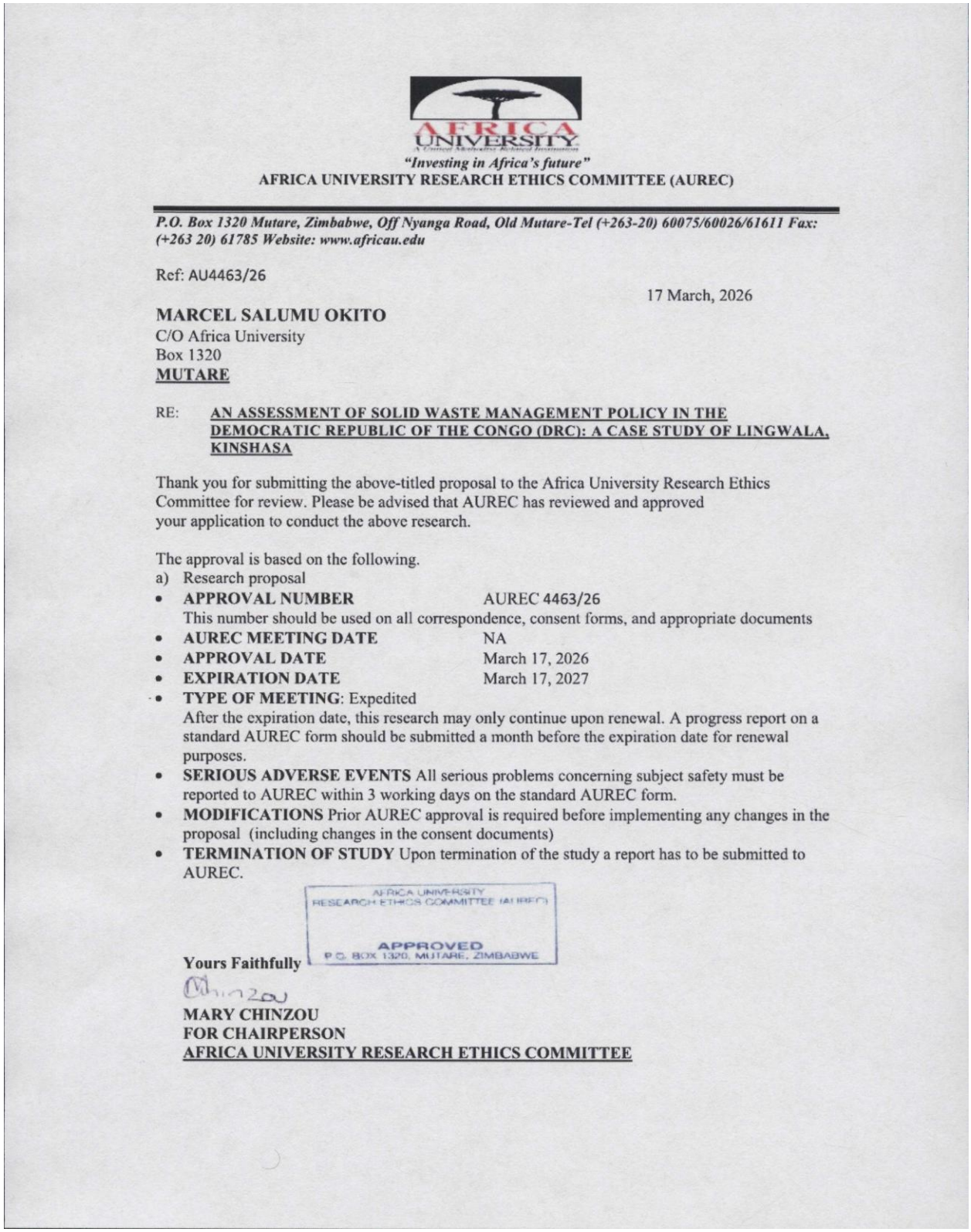
Nom du chercheur ----------

Appendix 3: Research Budget

The proposed budget hereby shows the estimates for the study and will be funded by the researcher.

Items	**Amounts (USD)**
1. Transportation	100
2. Internet	30
3. Stationaries	30
4. Printing and Photocopy	120
5. Pen	15
6. Research Permit	80
Total	**USD 375**

Appendix 4: AUREC Approval letter



"Investing in Africa's future"
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU4463/26

17 March, 2026

MARCEL SALUMU OKITO
C/O Africa University
Box 1320
MUTARE

RE: **AN ASSESSMENT OF SOLID WASTE MANAGEMENT POLICY IN THE DEMOCRATIC REPUBLIC OF THE CONGO (DRC): A CASE STUDY OF LINGWALA, KINSHASA**

Thank you for submitting the above-titled proposal to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal

- **APPROVAL NUMBER** AUREC 4463/26
  This number should be used on all correspondence, consent forms, and appropriate documents
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** March 17, 2026
- **EXPIRATION DATE** March 17, 2027
- **TYPE OF MEETING**: Expedited
  After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
- **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU
FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

Appendix 5: Approval letter from Lingwala Township (DRC, Kinshasa)

DEMOCRATIC REPUBLIC OF CONGO

City of Kinshasa
Lingwala Township
Environmental Department

Subject : Letter of Approval.

To the Head of Africa University, Zimbabwe.

Dear Sir/Madam,

We hereby approve Mr. Marcel SALUMU OKITO to conduct research in the Lingwala Township within the Environmental Technical Department.

As a student enrolled at your University in the College of Business and Management sciences, we hope that our request will be considered to facilitate his continued studies at Africa University.

Please accept, Sir/Madam, the expression of my highest consideration.

Kinshasa, March 23, 2026

For the Department

Head of Department

REPUBLIQUE DEMOCRATIQUE
DU CONGO

Ville de Kinshasa
Commune de Lingwala
Service de l'Environnement

Concerne : Lettre d'Approbation

Au Responsable de l'Université
AFRICA de Zimbabwe

Monsieur, Madame,

Nous venons par la présente approuver Monsieur Marcel SALUMU OKITO pour mener des recherches dans la commune de Lingwala au sein de service technique de l'environnement.

Etant inscrit dans votre établissement au sein de la faculté des sciences commerciales et de gestion, nous espérons que notre demande sera prise en compte afin de faciliter la poursuite de ses études à l'université Africa.

Veuillez agréer Monsieur, Madame, l'expression de ma considération.

Kinshasa, le 23/03/2026
Pour le service.
Chef de service