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Title: The Effectiveness of Solid Waste Management Systems: The Case of Kitwe

Master of Science in Environmental Management

A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, UNIVERSITY OF LUSAKA IN PARTIAL FULFILLMENT OF THE AWARD OF THE MASTER OF SCIENCE IN ENVIRONMENTAL MANAGEMENT.

BY

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1.0 DECLARATION

I, Vuwanengechi Gondwe, do declare that this dissertation titled **"The effectiveness of Solid Waste Management Systems in Zambia: The case of Kitwe"** was written by me under the supervision of Mrs Chishya Mzyece. The write-up conforms to copyright and academic writing rules and is in adherence to the University's research ethics. All sourced information in this write-up is acknowledged and referenced. The work has not been previously submitted to any University.

Signature of Student:  …….....

Date: 28th March 2024……..

Name of Supervisor: Mrs. Chisha Chongo Mzyece……

Signature of Supervisor:  …….....

Date: …28th March 2024.....

1.1 DEDICATION

To he who coined the term, “Torch bearer” and his line. To he whose pearl I am in the vast sands, and his crew. And the ever-green Rose.

1.2 ACKNOWLEDGEMENTS

This dissertation has been made possible by the unwavering support of my supervisor Mrs Chisha Mzyece. I would like to extend my gratitude to Kitwe City Council, particularly the Director of Public Health, Mr. Rodney Banda who provided some great insights. I would also like to acknowledge and thank the management of COPWASTE, particularly the Managing Director, Mr. Daniel Katongo for according me an opportunity to successfully study and analyse the company's solid waste management system.

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1.7 ACRONYMS/ ABBREVIATIONS

AoA	Articles of Association
CBE	Community Based Enterprise
COPWASTE	Copperbelt Solid Waste Management Company
ECZ	Environmental Council of Zambia
EM	Engineering Management
EMA	Environmental Management Act
EPI	Environmental Performance Indicator
EPPCA	Environmental Protection and Pollution Control Act
IDI	In-Depth Interviews
KCC	Kitwe City Council
KII	Key Informant Interviews
LCC	Lusaka City Council
MLGI	Ministry of Local Government & Infrastructure
MOU	Memorandum of Understanding
PPP	Private Public Partnership
SDG	Sustainable Development Goal
SLA	Service Level Agreement
SOP	Standard Operating Procedure
SWM	Solid Waste Management
SWMS	Solid Waste Management Systems
TO	Technical Officer
UNEA	United Nations Environmental Assembly
UNEP	United Nations Environmental Programme
WB	World Bank
ZEMA	Zambia Environmental Management Agency

ZCCM	Zambia Consolidated Copper Mines
8th NDP	Eighth National Development Plan

1.8 ABSTRACT

Waste is an unavoidable by-product of human activities and efforts to manage it have led to the development of various waste management systems as per society. Like any other community, Ndeke Presidential area of Kitwe is not averse to the challenges of waste. As the area is newly built up, the increase in the population has led to the need for a proper SWMS.

The objective of the study was to examine the effectiveness of the solid waste management systems in Zambia with COPWASTE as a case study by assessing the company's waste management practices and alignment to the crucial solid waste management principles.

The study was premised on the mixed methods approach and the sample was drawn from Ndeke Presidential Area in Kitwe. Questionnaires were used in Ndeke and Key informant interviews were used for KCC and COPWASTE. Analysis of results was done using the thematic method.

The study found that COPWASTE has challenges in collecting waste on the scheduled days and at the agreed frequency due to high rates of equipment break – downs. The research concluded that though a SWMS is in place, it is outdated as it is not in alignment with best and key SWM principles. It was also concluded that the system was not effective as it was not responsive to the current waste management challenges and opposed key principles such as the preferred waste management options in the waste management hierarchy.

The report ended with a recommendation for future studies on how to encourage the principles of prevention and minimization so that less waste ends up being disposed off.

CHAPTER 1

2.0 INTRODUCTION

2.1 BACKGROUND

Waste is an unavoidable by-product of most human activities. In an effort to avoid the effects of uncontrolled waste in society such as outbreaks of disease, it is imperative that an effective system of managing solid waste is developed.

World over, solid waste commonly referred to as garbage is generated every second. According to the World Bank (WB), in 2020, the world was estimated to generate 2.24 billion tonnes of solid waste, amounting to a footprint of 0.79 kilograms per person per day. The WB further extrapolated that annual waste generation is expected to increase by 73% from 2020 levels to 3.88 billion tonnes in 2050. Sub-Saharan Africa generates approximately 62 million tons of garbage annually.

The UN-Habitat (2010) highlighted that Zambia's waste generation rates were approximately 0.52 kg per person daily. While this may seem modest compared to the 0.79 kg average waste per person generated world over, most garbage in the developing world is not collected by municipal collection systems because of poor management, equipment failure, or inadequate garbage management budgets, thereby worsening waste management and sustainable disposal and treatment, such as is the case of Zambia.

The world population dashboard (UNFPA 2023) asserts that the global population of 2023 is estimated at 8,045 million. Zambia has seen a steady increase in population from 2000 to date with statistics of 9.9 million in 2000, 13.1 million in 2010 and 19.6 million in 2022, respectively (ZSA 2022). Of particular interest, is the population trend of Kitwe which has had a steady annual average increase of 3.5% over the past 15 years. The population of Kitwe was estimated at 451,000 in 2007 and at 763,000 in 2022 (UN-WPP 2022). The population of Kitwe has been increasing steadily and exponentially.

An increase in population entails an increase in demand for all services essential for sustenance of human life. These include economic goods, environmental goods and services as well as social services such as correctional, adoptional and municipal services. Hoornweg (2013) investigated and affirmed the direct link between a rise in population and the quantity of waste produced. He asserted that in developed countries, the amount of waste is rising due to the continuous increase of the human population, changes in lifestyle and increasing urbanization (Hoornweg et al. 2013.). Therefore, an increase in population is directly proportional to an increase in the consumption of goods and services.

To deal with increased waste, different societies have set up varying waste management systems. New and immediate solutions to the problem of waste are required. According to Jouhara (2017), the collect – transport – dispose kind of WMS is outdated as it accounts for approximately 40% to 60% of an area's waste management costs.

Seldon (2017) defined a solid waste management system as a streamlined process comprised of a series of comprehensive strategies utilized by institutions to efficiently dispose of, reduce, reuse, and prevent waste. While being cognizant of the logical series of waste management, there isn't a universally accepted Waste Management System (WMS). Every community must evolve its own system which takes into account the quantity and character of waste, financial capability and technical expertise.

A good WMS is a requirement for avoidance of outbreak of diseases, reduced pollution, a sanitary environment and general public and environmental health. An efficient SWMS therefore has certain distinguishing characteristics. Among them are solid waste source management practices such as separation and reduction of waste, proper, efficient and recommended waste collection equipment such as skip loaders and compactors and sustainable disposal systems such as recovery and reclamation. Of great importance to running a good SWS is the availability of a skilled workforce. (Filemon, 2008). All in all, municipalities must strive to run the

SWMSs from an integrated approach encompassing the five (05) Rs of SWM namely, Refuse, Reduce, Re-use, Reclaim and Recycle.

According to the World Population Review, Denmark topped the chart for the cleanest country worldwide in 2022, with an Environmental Performance Indicator (EPI), which focusses on ecosystem vitality and environmental health, of 77.9%, scoring 99.8% in waste management. The Danish waste management system places a lot of emphasis on a circular economy. This is evidenced by the focus areas of their Plan for Circular Economy which constitutes the national plan for the prevention and management of waste for 2020-2032. Among them are less waste and better use of natural resources, more and better recycling, better use of biomass, a sustainable built environment and less plastics in a circular economy.

In the African set up, SWM has taken the route of open air burning, indiscriminate waste dumping, recycling and disposal in dumpsites. Due to the increasing populations, generation of waste is projected to increase too, thereby exposing the African masses to the poorly managed waste in the disposal sites and illegal dumping areas. Over time, due to leaching into ground water the dumped wastes may end up in water bodies such as rivers and lakes leading to water pollution. This has repurcussional issues on the life of humans, animals and the environment. Many African countries are seeing the need to approach SWM from a different angle. More and more countries are focusing on implementing SWMSs that embrace sustainable methods of waste disposal and management technologies such as leveraging emerging waste recovery, reduction and recycling technologies.

NEPAD guides that countries like Ethiopia, Kenya and South Africa have been instrumental in pioneering waste management technologies that enhance sustainable solutions to the challenges of solid waste. For example, Ethiopia has been using the Koshe dumpsite in Addis Ababa as a landfill facility. In 2017, the government began a transformational process of landfill management that saw a shift from the dumpsite being primarily utilized as a landfill but as a waste-to-energy generation facility. There has since been a marked difference in the quantity of waste that is not recovered. Kenya is another country that is reportedly leveraging

new technologies to cement better, efficient and sustainable waste management approaches. Kenya has successfully set up a system of waste collection, sorting, recycling and composting all in a bid to reduce the quantity of waste that ends up in the landfill.

Solid waste management (SWM), is the one thing which almost every municipality provides for its residents and it is probably the most significant municipal service and a prerequisite for other complicated municipal services like health, transportation or education (Rajendran et al., 2013). In Zambia, solid waste management is a function of the Ministry of Local Government and Infrastructure (MLGI) and is a mandate of the local authorities throughout the country. The local authorities have set up SWMS that are aimed at ensuring that towns are garbage free. Waste management is mainly guided by the National Solid Waste Management Strategy for Zambia (2004) and the Solid Waste Regulation and Management Act (2018). The policy instruments are still under formulation.

Copperbelt Solid Waste Management Company (COPWASTE), a quasi-government institution set up by seven local authorities namely Ndola & Kitwe City Councils, Chingola, Chililabombwe, Mufulira Luanshya & Kalulushi Municipal Councils, was operationalised in 2007. The company was tasked to manage solid waste in residential and commercial areas as well as the dumpsites in the associated towns on behalf of the local authorities. The model that was adopted at inception by the company was characterized by collection – transportation – disposal – layering and compaction. As of August 2023, the same model is still being used by the company.

This research seeks to understand if the solid waste management system being used by COPWASTE is responsive to today's solid waste management challenges as compared to when the company was established in 2007.

2.2 STATEMENT OF THE PROBLEM

Privatisation of the mines in the late 1990s saw a shift in the responsibility of waste management from Zambia Consolidated Copper Mines (ZCCM) and the Local

Authorities to Local Authorities only. The Local Authorities in the major towns on the Copperbelt, having formed a company to manage the solid waste in residential and commercial areas, COPWASTE, stepped back and concentrated on public places. Over time, factors such as development of new townships, population increase as well as the company's fleet for waste management becoming run down led to a decline in the quality of services the company was providing. The waste management system used from the inception of the company, 2007, has not been altered, reviewed or revised.

In examining the company's waste management system, the question that begs an answer is, is the system being used today responsive to the waste management requirements for townships?

2.3 RESEARCH OBJECTIVES

1. To assess the company's adherence to its service level agreement with its clients
2. To assess the adaptive levels of the company to current prevailing levels of waste management challenges
3. To evaluate the alignment of the company's SWM policies to necessary legal requirements
4. To assess the solid waste management knowledge levels of waste generators.

2.4 RESEARCH QUESTIONS

1. Is the company operating up to its Service Level Agreement (SLA) with its clients?
2. What are the knowledge levels of waste generators with regards to SWM?
3. What are the company's guiding policies for the SWMS?
4. Are stakeholders involved in the SWMS of the company?

2.5 SCOPE OF THE STUDY

The population of interest were residential waste generators, the Adminstration Department of COPWASTE and the officers from the Department of Public Health, Kitwe City Council.

The residential area that was sampled from was Ndeke Presidential of Kitwe, Copperbelt Province, Zambia. Ndeke Presidential is a fairly new built-up area commonly referred to as “kuma plots”. Most of the area’s inhabitants are recent landlords who have mostly been renting properties in the high-cost areas of Kitwe such as Parklands and Riverside. The resident’s income generating activities vary from the working class to Small and Medium Enterprise owners. According to the Kitwe City Council’s records, the population of Ndeke Presidential Area was estimated at 7,200 (KCC, Planning Dept). The study also got some input from the directorate of Public Health at Kitwe City Council. The area was targeted because it has the highest number of subscribers. The subscribers are of a diverse range of the working class to business owners.

2.6 SIGNIFICANCE OF THE STUDY

The model for the SWMS used by COPWASTE was assessed in its entirety. Particular focus was on the waste generators and their role in the solid waste management chain and their level of satisfaction with the service delivery of COPWASTE. The study therefore guides as to the responsiveness of the current solid waste management system to the challenges of SWM in townships.

2.7 ORGANISATION OF THE REPORT

The dissertation is divided into six (06) chapters with preliminary pages of acronyms, a declaration, lists of tables and pictures, contents table and the abstract.

Chapter One (01) introduces the topic by outlining the background, statement of the problem, research objectives, research questions, scope and significance of the study. Chapter two (02) details the literature reviewed on the topic, covering the global, regional and local situation on the topic. The framework is also

conceptualized in Chapter 02. Chapter three (03) highlights the methodology. It outlines the research approach and design, the sample size and sampling techniques, study population and area, data collection and analysis methods used during the research.

In Chapter four (04), the data collected is presented and analysed. Chapter five (05) critically assesses the results of the research and discusses them. Lastly, Chapter six (06) outlines the conclusions emanating from the research and gives recommendations.

CHAPTER 2

3.0 LITERATURE REVIEW

3.1 INTRODUCTION

Lawrence et. al (2012) describes a literature review as an organized way of presenting a logically argued case premised on a comprehensive understanding of the prevailing knowledge base, from previous studies, on the topic under study.

The purpose of this chapter is to scrutinise the literature available on the effectiveness of SWMS world over. The literature was reviewed from various sources, among them books, journals, publications, policy and legal documents.

The chapter presents an empirical review, a theoretical framework as well as a conceptual framework.

3.2 EMPIRICAL REVIEW

In 2015, Ntambo carried out research whose main objective was to establish the extent to which residential clients benefited from a system of subcontracting WMS by the Lusaka City Council (LCC). Ntambo asserted that the private WMS providers had many challenges in delivering a quality service due to competition with unlicensed service providers, bad road network leading to high down time of waste collection equipment as a result of frequent break-downs, unregulated tariffs and difficulties in collecting tariffs from clients as well as high operational costs. Ntambo's conclusions were that SWM in Lusaka was characterized by inefficient, insufficient and ineffective waste collection methods or systems, biased coverage of service areas and that Zambia had no stand-alone legislation for waste management. Therefore, subcontracting of waste management services to private companies was not beneficial to residential clients of Lusaka.

Tembo (2020) conducted research in Kabwe focusing on the effectiveness of WMS in the markets. The sample was drawn from two markets namely Kasanda and Kabwe Green markets. The researcher concluded that though SWMS are present in the markets, they are ineffective. The researcher went further to recommend that deliberate efforts can be made by the government of the Republic of Zambia to identify and entice individuals and/ business entities to undertake projects that

would focus on recycling the solid waste by providing grants, loans and incentivising the initiatives.

Godfrey et. Al (2019) in the research for their publication titled "Solid waste management in Africa: Governance failure or development opportunity" asserted that solid waste was a multi – disciplinary problem and that there was need for African politicians to prioritise sustainable waste management approaches if the Sustainable Development Goal (SDG) 2030 on sustainable development was to be realized. They recognized that if waste was diverted from dumpsites and instead seen as a resource and channeled to recycling, re-use and recovery it could potentially empower many informal waste reclaimers and create jobs for the masses. Among the factors spurring the poor management of waste were ineffective organizational structures, conflict, unskilled manpower, corruption and a lack of genuine political will.

Wei et. Al's research titled Solid Waste Management in China: Policy and Driving Factors in 2004 -2019 studied the statistics surrounding domestic, industrial and hazardous wastes in China over the period 2004 to 2019. They asserted that SWM is directly or indirectly affected by government policies as well as development of technologies and economics and that the revolutionisation of the industrial structure would alter the generation and subsequent treatment of industrial solid waste while urbanization reduced the output of domestic waste per unit capita. Their conclusions were that China has been continuously improving its WMS through the exploration of recycling, resource re-use, source reduction and harmless treatment. These processes require appropriate technologies and capital investments. Investments in technologies that abate environmental pollution have led to a reduction in solid waste. Further development of technology is expected to reduce capital investments in the same.

3.4 THEORETICAL FRAMEWORK

1. Hoornweg confirmed the direct link between a rise in population and the quantity of waste produced when he postulated that in developed countries,

the amount of waste is rising due to the continuous increase of the population, changes in lifestyle and increasing urbanization (Hoornweg et al. 2013.).

2. The United Nations Environmental Assembly (UNEA) through the United Nations Environmental Programme (UNEP) has guided that poor waste management - ranging from non-existing collection systems to ineffective disposal -causes air pollution, water and soil contamination. Open and unsanitary landfills contribute to contamination of drinking water and can cause infection and transmit diseases. The solution, in the first place, is the minimisation of waste. Where waste cannot be avoided, recovery of materials and energy from waste as well as re-manufacturing and recycling waste into usable products should be the second option. (UNEP 2022)

3. The Solid Waste Regulation and Management Act (2018) lists the key concepts and principles of solid waste management. It also guides that among the functions of a solid waste management company is to ensure that solid waste management services are accessible, sufficient, affordable, safe and acceptable on a non-discriminatory basis.

4. In today's world, the three Rs (3 Rs), reduce, re-use and recycle have emerged as a sustainable way of managing waste. Stuey and Stannered (2006) advanced the waste management hierarchy which moves from the least favourable options of waste management to the most preferred. It is depicted as below;

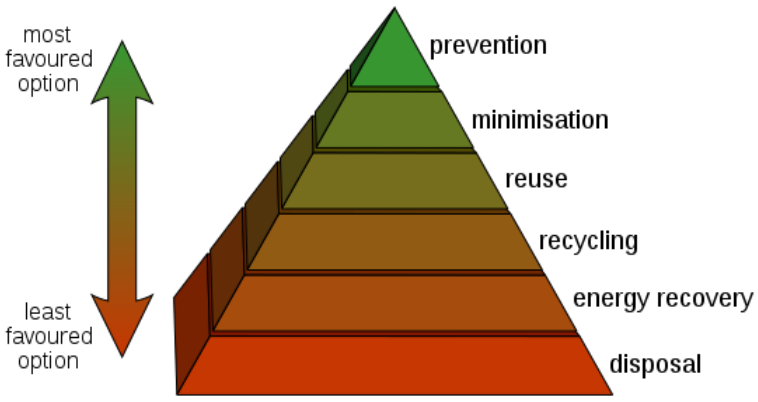


Fig 1: Waste Management Hierarchy, adapted from Stuey (2006)

5. Managing municipal solid waste is a big challenge. Inappropriate municipal solid waste management not only causes critical environmental impacts (climate change, environmental and human health damage, biodiversity loss, soil erosion) (Hoornweg and Bhada-Tata, 2012, Cleary, 2009)

6. Mwanza et al (2018) in their study aimed at reviewing the present municipal solid wastes (MSWs) management system, from an Engineering Management (EM) perspective, for the City of Kitwe while proposing a levers-driven sustainable municipal solid waste management (MSWM) model focusing on improving waste management (WM) postulated that the existing MSW system for the city is highly unsustainable and lacks EM methodologies. There are still a number of challenges in the management of MSWs which include: lack of proper collection and storage of MSWs; lack of an engineered landfill; lack of waste recovery and treatment systems; and lack of public education aimed at reducing and separating MSWs.

7. Currently, MSW management is undergoing an evolution from mere disposal, such as landfills, to sustainable management, such as 3R (reuse, recycle, reduce) (Agamuthu et al., 2011).

8. Based on a system perspective, a waste collection system (WCS) is comprised of component containers and vehicles, which are inter-dependent and where interactions occur, forming a relative complex whole. The way how

elements interact with each other and with the background system, composed of the waste producers (citizens) and the city's infrastructure will dictate its efficiency and the interaction with the city's mobility. A WCS has to be attractive, available, near and safe for citizens to use. (Pires et. Al, 2019)

9. The National Solid Waste Management Strategy for Zambia (2004) formulated by Environmental Council of Zambia (ECZ), now Zambia Environmental Management Agency (ZEMA) placed a lot of emphasis on the use of an integrated approach utilizing internationally accepted waste hierarchy and principles including polluter pays principle, integrated life cycle principle, source reduction principle, precautionary principle and the principle of cooperation. The The objectives included, to minimise the generation of waste, to maximise waste collection efficiency, to reduce the volume of waste requiring disposal and maximise the economic value of waste, to develop and adopt environmentally sound treatment and disposal facilities/practices

10. The current Zambian National Development Plan (NDP) running from 2022 to 2026 has four focus areas or pillars. It is worth noting that for the first time, an environmental sustainability pillar is standing on its own stating that in pursuit of the economic transformation agenda, it is imperative that development pathways are sustainable. This entails the sustainable utilisation of natural resources which are the basis for wealth creation, as well as building resilience to the adverse effects of climate change. Thus, measures aimed at promoting green growth, safeguarding the environment and natural resources, enhancing climate change mitigation and adaptation, as well as strengthening disaster risk reduction, have been prioritised. (8^{th} NDP)

11. The Vision 2030 for Zambia is cognizant of the importance of tackling environmental matters and asserts that 100 percent of the population in both urban and rural areas of Zambia should have secure access to safe potable water sources and improved sanitation facilities.

12. The Joint Sector Report (2018) reported that from the time COP-Waste switched from collecting service fees from the bundled tariff with water utility companies to self-revenue collection schemes, it has been unable to garner enough resources for capital investment. The report went further to state that the equipment is old and is not far off from reaching its useful lifecycle. The report asserted that if the company was not recapitalised, its sustainability was in question.

3.5 CONCEPTUAL FRAMEWORK

The effectiveness of a solid waste management system is as a result of an integrated management approach. It is informed by identifying the problem, formulating the legal framework of operating, implementation of the plans, review and if need be, amendment of the initial operational plan. In order to understand the effectiveness of COPWASTE's solid waste management chain, it is imperative to examine the working policies and legal framework. The factors that would ensure an effective solid waste management system include, adequate waste collection equipment, trained personnel, cost reflective tariffs and a good revenue base. This is depicted in Fig 2 below;

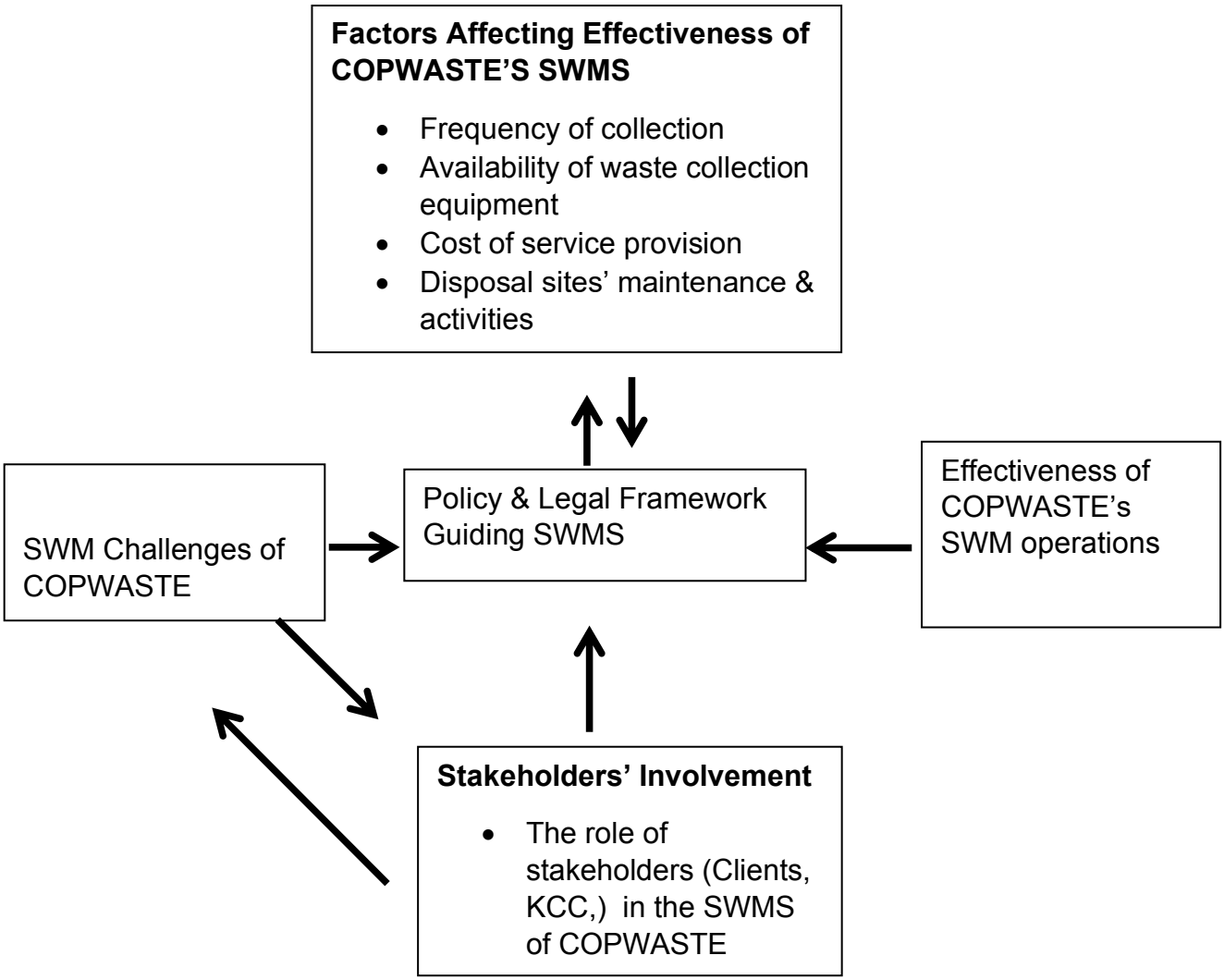


Fig 2: Conceptual Framework, Source – Researcher's design

3.6 CONCLUSION

This Chapter highlighted the works that have been previously done by other researchers relating to the effectiveness of solid waste management systems. Literature surrounding the very topic as well as theories that have been advanced were also reviewed.

CHAPTER 3

4.0 METHODOLOGY

4.1 INTRODUCTION

A research methodology is a step-by-step guide of how particular research is conducted. It details the steps a researcher takes in order to solve the research problem. Patel (2019) intimated that a research methodology is a way of systematically resolving a problem and may be understood as a science of scientifically studying research. The different steps adopted in studying the problem and the flow of logic behind it are studied.

In this Chapter therefore, the research methodology that was adopted in trying to understand the effectiveness of the SWMS used by COPWASTE was outlined.

4.2 RESEARCH APPROACH

The study was based on the mixed methods research approach. This approach makes use of a combination of both the qualitative and quantitative research methods. It is worth mentioning that the researcher had initially anticipated to only use the qualitative approach (as stated in the Research Proposal) but as the research progressed, it became clear that in order to have a better understanding of the research problem, it was imperative to adjust the research approach from qualitative to mixed method.

4.3 RESEARCH DESIGN

The study took a mixed methods research form particularly that of a case study approach. In-depth interviews (IDI), a detailed and up-close examination of the case, as well as its related contextual conditions, questionnaires and key informant interviews (KII) were used. The approach placed a lot of emphasis on studying small samples of purposely chosen individuals.

4.4 STUDY POPULATION

The study population was comprised of;

1. The employees of COPWASTE.

   Of particular interest were the officers from the departments in charge of operations and administration.
2. Officials form Kitwe City Council (KCC) Public Health Department

   -The director of Public Health

   -The cleansing manager
3. Sampled residences of Ndeke Presidential.

4.5 SAMPLE SIZE

A sample size of twenty -two (22) comprising of five (05) staff from COPWASTE, two (02) key informants from KCC and fifteen (16) households from Ndeke Presidential residential area. This is as shown in Fig 3 below;

Table 1: Sample Size Distribution

Sn	Respondents	Number
1	KCC Officials	02
2	COP-WASTE Employees	05
3	Ndeke Presidential Residents	16
	Total	**22**

4.6 SAMPLING TECHNIQUES

This research employed a non-probability sampling design, particularly purposive sampling to select the participants from COPWASTE and KCC and households in Ndeke Presidential.

4.7 DATA COLLECTION/INSTRUMENTS

The researcher had been given verbal clearance by the management of COPWASTE to use their institution as a case study. One on one interview guides were used to collect primary data from COPWASTE and KCC. Interview guides

ensured non-divergence from the core subject as well as follow-up questions from the researcher in cases where respondents may not have been clear.

Questionnaires were used to collect primary data from the households in Ndeke Presidential.

The researcher also endevoured to collect primary data through observations within the setting to be studied. The observations included among others, time and frequency of waste collection, state of waste collection equipment, number of staff collecting waste and how households store the waste. The researcher spent three weeks working with the COP-WASTE crew in the study area in order to present current, reliable and valid findings.

4.8 DATA ANALYSIS

The data collected was analysed both quantitatively and qualitatively. The thematic approach was used. Numerical, written and spoken information was grouped and converted into data that could be interpreted and analysed to bring out similar themes based on the research objectives and questions.

4.9 RESEARCH TIMEFRAME OF RESEARCH ACTIVITIES

The research was carried out over a period of three months from October 2023 to December 2023. The researcher collected data in the month of October and November. The month of November was also allocated to analysis of research results. The researcher submitted a report of the research on 31st December, 2023.

4.10 ETHICAL CONSIDERATIONS

The researcher was granted permission by the two institutions, that is COP-WASTE and KCC, to interact with their officers for purposes of obtaining the information necessary to complete the research.

The respondents were assured that the information given was to be treated with the highest confidentiality and their participation was on a voluntary basis. The

respondents were also informed that the research was purely an academic exercise and the report was to be a property of University of Lusaka (UNILUS).

4.11 CONCLUSION

In this Chapter, the researcher outlined the steps that were followed in order to conduct the research. The researcher had to modify the research approach to adapt to the needs of the research.

CHAPTER 4

5.0 PRESENTATION & ANALYSIS OF RESULTS

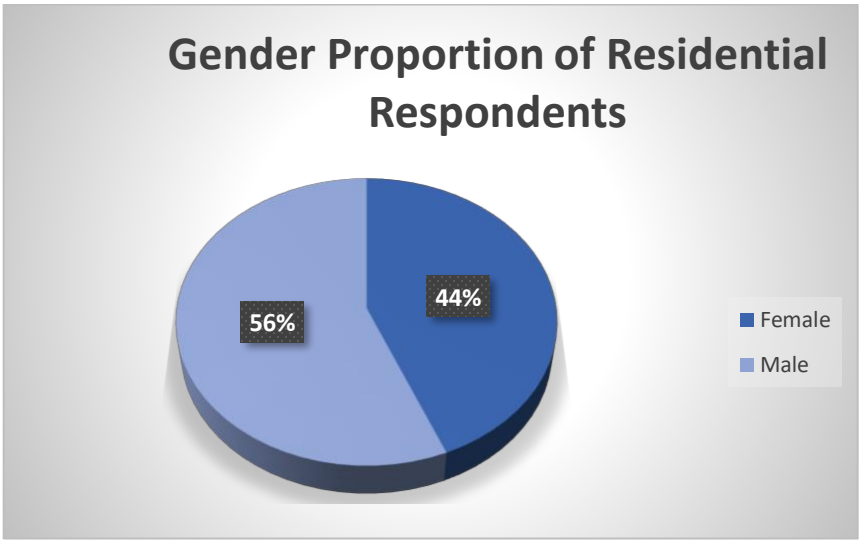
5.1 INTRODUCTION

Presentation and analysis of research results is a very important aspect in every research. Evers et al 2018 in their book Collaborative Research Design, guide that the main reason for displaying and presenting data is to substantiate the arguments advanced without misleading or biasing understanding and interpretation.

In this Chapter, the data collected using questionnaires as well as through the one-on-one interviews with key informants was presented and analysed. As the researcher had spent a week in the field, Ndeke Presidential Area, the results from the researcher's observations was also presented and analysed. It should be mentioned that the results presented are those that were key not only to the subject matter of this research but addressed the research questions as well.

5.2 RESULTS FROM RESIDENTIAL QUESTIONAIRES

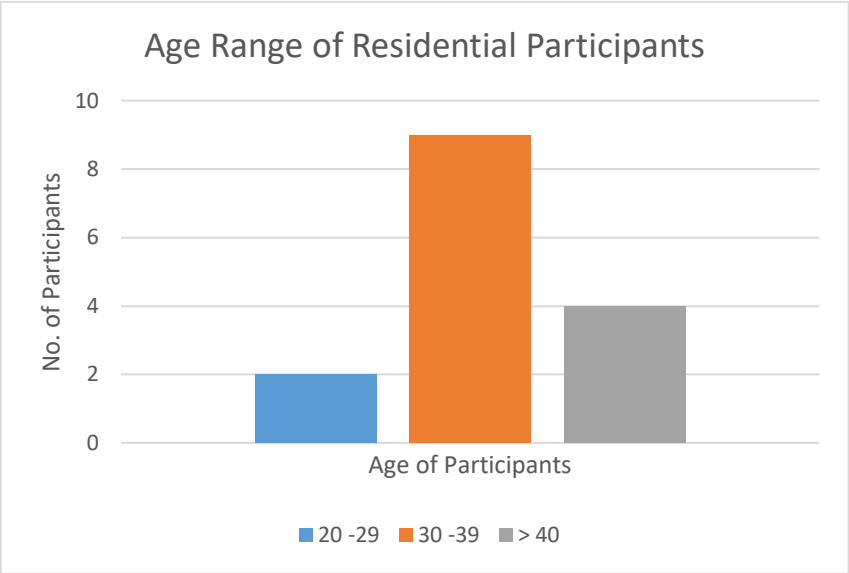
Fig 4: Gender Analysis of Respondents



Source: Researcher's Design

The data above (Fig 4) shows that there was a 44% participation of females in the study while that of males was higher, at 56%.

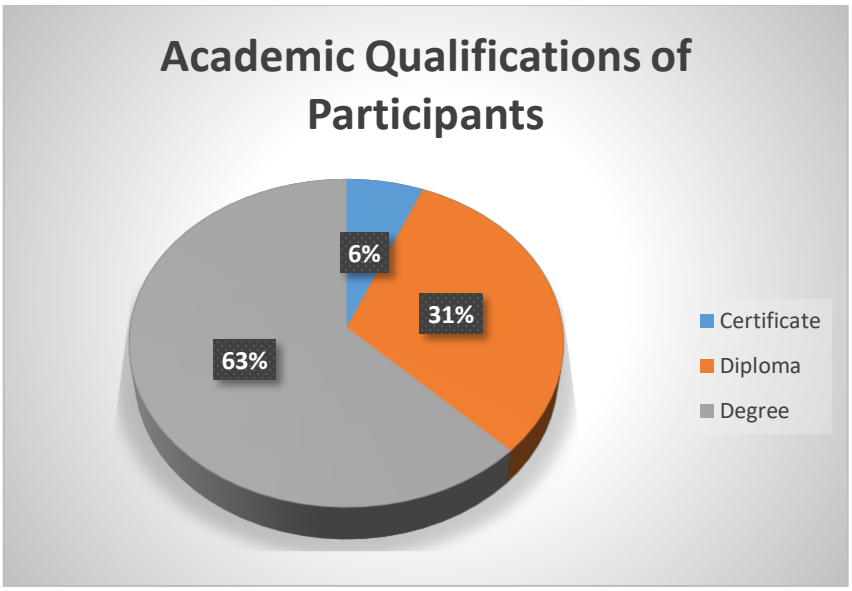
Fig 5: Age analysis of Respondents



Source: Researcher's design

The data collected and presented in Fig. 5 showed that more than 60% of the participants in the research were in the age range of 30 – 39 years, while 27% were above 40 years and 13% were in the age range of 20 – 29 years.

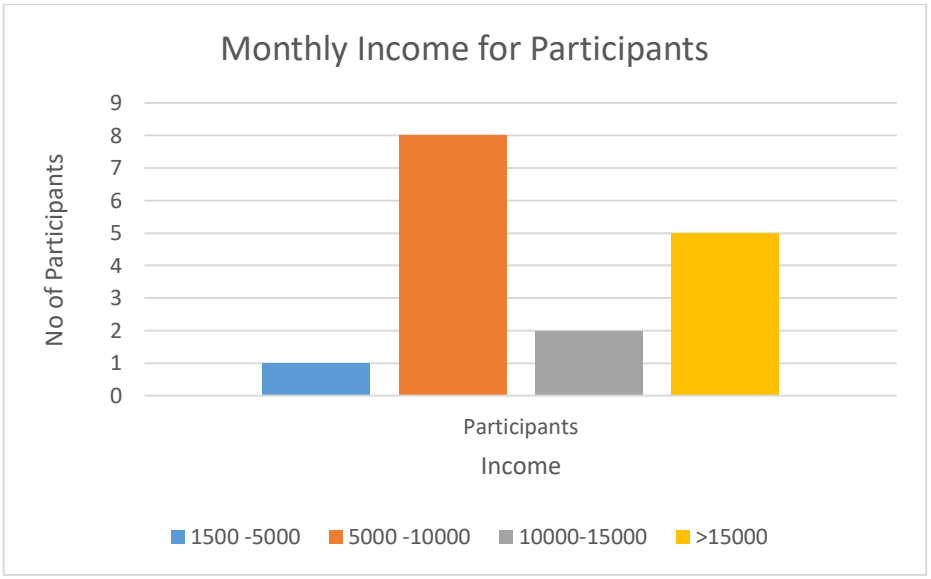
Fig 6: Education Levels of Respondents



Source: Researcher's design

The pie chart in Fig 6 showed the spread of the tertiary qualifications of the participants in the research. 63% of the participants were degree holders, 31% diploma holders and 6% with certificates.

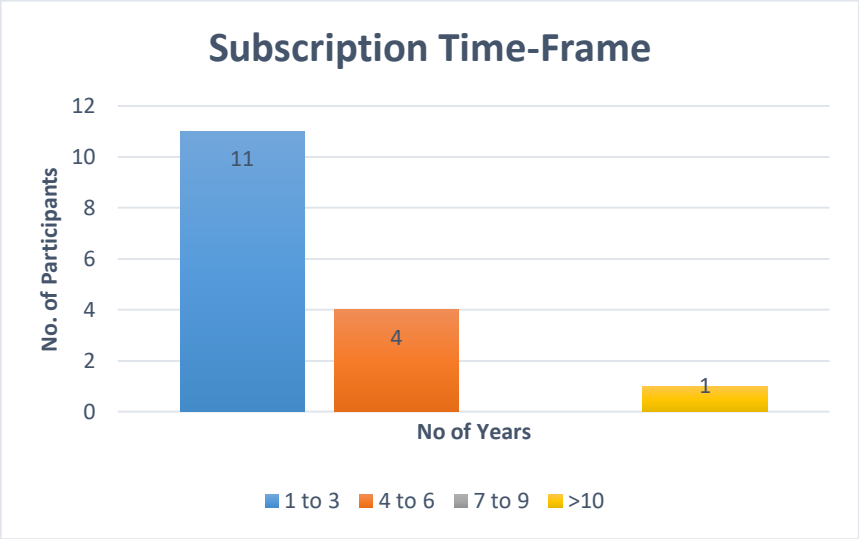
Fig 7: Income Levels of Respondents



Source: Researcher's design

Fig 7 showed that 08 of the participants were in the income bracket range K5,000 – K10,000, while 05 earned above K15,000, 02 in the range of K10,000 – K15,000 and 01 earning between K1,500 and K5,000 per month.

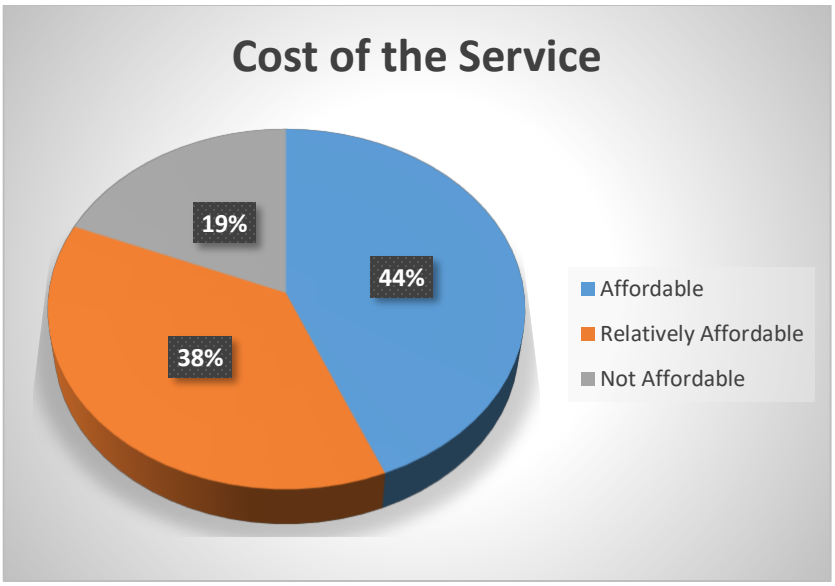
Fig 8: Duration of Subscription to COPWASTE



Source: Researcher's design

Fig 8 data revealed that eleven (11) of the participants had been clients of COPWASTE not more than three (03) years, four (04) for not more than 06 years and 01 for more than 10 years.

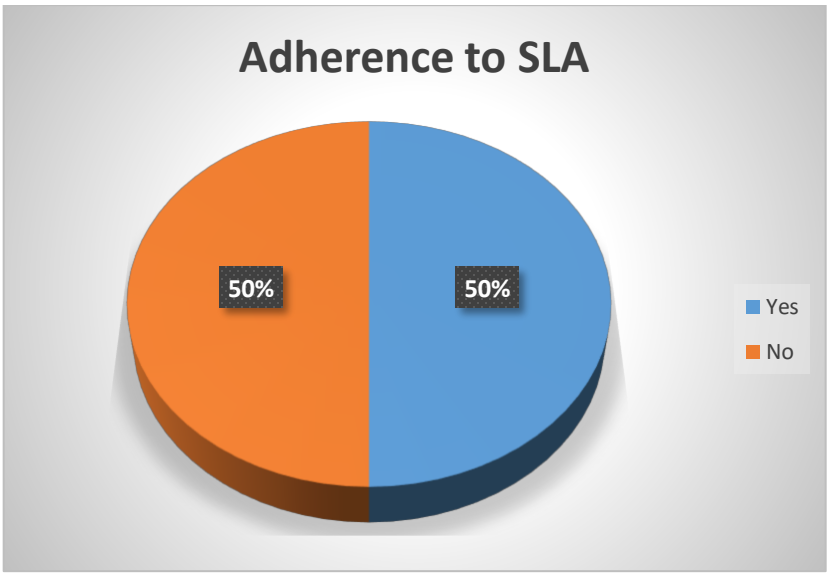
Fig 9: Affordability of service



Source: Researcher's design

In Fig 9, 44% of the respondents were of the view that service was affordable with 38% leaning towards relative affordability. However, 19% felt that the service was not affordable.

Fig 10: Adherence to service level agreements



Source: Researcher's design

Fig 10 showed the proportions of those who were of the view that COPWASTE adhered to the Service Level Agreements (SLA) and vice versa. The spread of the

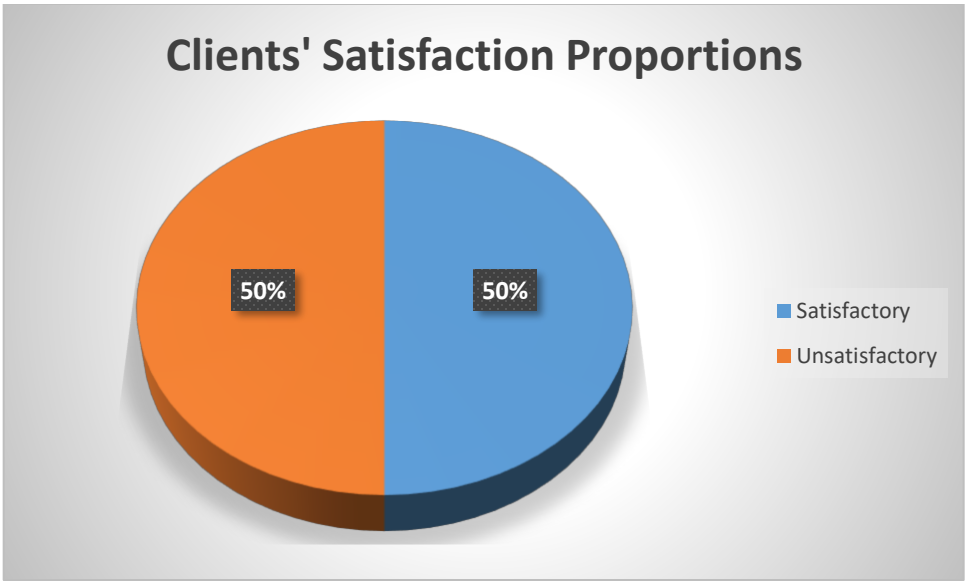
data showed that 50% of the respondents thought that the company adhered to the SLA while the other 50% did not.

Fig 11: COPWASTE's Service Rating by Clients

Source: Researcher's design

Fig 11 was a representation of the rating of the service offered by COPWASTE to the residents of Ndeke Presidential Area, by the clients themselves. 50% equivalent to 08 of the clients gave a rating of bad while while 03 and another 03 felt the service was good and moderate respectively. The other 02 clients gave the company a rating of very bad.

Fig 12: Clients' Reaction to Service Delivery



Source: Researcher's design

In Fig 12, 50% of the participants expressed their satisfaction with the service delivery of COPWASTE while the other 50% was unsatisfied.

5.3 CHALLENGES FACED BY COPWASTE

The residents of Ndeke Presidential asserted that the challenges COPWASTE had were that the company did not have enough waste collection equipment. The few pieces of waste collection equipment that the company had encountered too many break-downs resulting in inconsistent service delivery. The residents of Ndeke Presidential also indicated that the pay points rarely had enough bin liners for sale and that the company had rude personnel.

5.4 RESULTS FROM KITWE CITY COUNCIL

About the Respondents

The interviews were conducted at the Kitwe City Council (KCC), Public Health offices. The respondents were the Director of Public Health and the Cleansing Manager, males aged fourty-two (42) and fourty-six (46) years respectively. They have worked for the KCC for three (03) and eight (08) years.

5.6 KCC'S KNOWLEDGE OF COPWASTE

KCC is one of the seven shareholders of COPWASTE, a company which was formed in 2007. It's operations in Kitwe are stretched all over the city which is proving difficult for the company to manage. KCC has since introduced three (03) franchise companies namely Ceegees, Lembi Protective Systems, Citimop as well as Community Based Enterprises (CBEs).

The officers from KCC guided that COPWASTE's basic SWMS is collection – transportation – disposal and the waste that the company collects is disposed off at the KCC's managed dumpsite, namely Ichimpe. The local authority collects solid waste from public places to avoid nuisances and their SWMS is that of collection – transportation – disposal with a collection frequency of once per week for residential clients and as per agreement with commercial clients. With regards to the question of whether COPWASTE has service level agreements with their clients, KCC could not guide clearly.

KCC stated that all franchise SWM companies and CBEs are guided on the minimum and maximum tariffs but were not sure whether COPWASTE followed the guidelines. KCC also could not state definitively whether the company had transportation and disposal licenses. On the issue of submission of returns, KCC stated that the company does not submit returns.

5.7 ATTITUDES AND SWM PRACTICES OF NDEKE PRESIDENTIAL RESIDENTS

KCC council asserted that Ndeke Presidential residential area was a newly constructed area which had seen a lot of new residential structures within the last seven (07) years. The kind of occupants that the area has are very willing to subscribe for the service. The KCC stated that they continue to receive numerous complaints from residents about the failure of the company to provide the service as per the agreement between the clients and the company, despite it being a pre-paid service.

KCC also informed the researcher that the subscription numbers for the service of waste collection were rather low and that due to this, the area has a lot of waste heaps by the road sides and on undeveloped plots. There are informal garbage collectors in the area that are paid very low amounts. They carry the waste on their wheel barrows and dump the waste in undesignated dumping areas, undeveloped plots being the most targeted.

5.8 CHALLENGES FACED BY COPWASTE IN SERVICE PROVISION TO NDEKE PRESIDENTIAL

KCC stated that COPWASTE had inadequate capacity to provide an effective and efficient waste collection service to the residents of Ndeke Presidential. They did not have enough waste collection equipment. The officers from KCC informed the researcher that at the time of data collection, the company was running one (01) truck in the entire Kitwe. This truck was servicing both residential and commercial clients and so the clients from Ndeke Presidential were quite affected. On several occasions, the KCC has had to help COPWASTE by allocating some of its waste collection equipment to supplement the inadequacy.

The officers from KCC informed the researcher that the one piece of equipment that was allocated to service Ndeke Presidential once a week was quite aged and hence the frequency of break-downs for the company's equipment was too high. The company had no alternative or contingency equipment for when such happens.

5.9 CHALLENGES FACED BY KCC IN MONITORING COPWASTE

The KCC stated that as per the Solid Waste Regulation and Management Act (2018), the local authority was in-charge of waste management in the city. This responsibility had been delegated to COPWASTE. The local authority therefore expected a minimum level of engagement and information sharing by COPWASTE. They stated that the company rarely engaged them on matters to do with the company and mostly received information about the company from the Ministry or clients.

The officers from KCC indicated that they were not aware of COPWASTE's business plan and business strategy and therefore were not in the know of the company's business progression. The officers informed the researcher that the company did not submit returns to the local authority and neither did they hold regular shareholders' meetings. It was therefore quite difficult to assess the company's efficiency in service delivery in Ndeke Presidential. The company's financial position was equally unknown.

5.10 RECOMMENDATIONS FOR IMPROVEMENT

The officers from KCC recommended that;

- The company needed to engage their shareholders more frequently through meetings in order for the KCC to appreciate the challenges the company was being faced with fully.
- The company should consider accessing the green funds as grants or guaranteed loans
- The company should complete the process of re-alignment to the new law at the earliest possible
- The company needed to start submitting the necessary returns to the local authorities.
- The company should review its policies that border and guide on waste collection.

5.11 RESULTS FROM COPWASTE

Table 2: About the respondents

Sn	Respondent's Designation	Gender	Age (Years)	Employment Duration (Years)	Academic Qualification
1	Operations Manager	M	41	13	Degree
2	Finance & Adminstration Manager	M	47	08	Degree
3	Technical officer	M	51	16	Certificate
4	Driver	M	38	07	Certificate
5	Handyman	M	34	08	G 12 Certificate

Source: Researcher's design

The table above, Table 2, lists the employees from COPWASTE who participated in the study. The Operations Manager was a 41-year-old man who had been with the company for thirteen (13) years and was promoted to the position of Operations Manager in the year 2017. He holds a Bachelor of Science. The Finance & Adminstration Manager was a 47-year-old man with a degree in Accountancy and had been with the company for 08 years. The Technical Officer, Driver and Handyman were males aged 51, 38 and 34 and had worked for COPWASTE for 16, 07 and 08 years respectively.

About COPWASTE

The respondents stated that COPWASTE was wholly owned by seven (07) Copperbelt local authorities (Kitwe, Ndola, Chingola, Chililabombwe, Mufulira, Kalulushi and Luanshya) and was operationalised in 2007. The company's head office is in Kitwe and clients include small, medium and big commercial entities as well as residential clients. At the time of the research, the company had one hundred twenty - three (123) commercial clients and two thousand two hundred twenty – eight (2,228) residential clients across all its branches / divisions. The company had physical presence in all the operational towns except Kalulushi. There were established offices with personnel and structures in place.

The respondents also guided that the company had a total number of 47 employees with 45 being permanent employees and 02 employees on short term contracts. Of these, 26 were in the Operations Department and were directly involved in the handling of waste at different levels. Kitwe had 13 officers in the Operations Department. These included 03 drivers, 06 handymen, 02 mechanics, 01 Technical Officer and 01 Operations Manager. The average age of the handymen was 35. This is summarized in the table below;

Table 3: Composition of the Kitwe's Operations Department

Sn	**Designation**	**Number of Personnel**
1	Operations Manager	01
2	Technical Officer	01
3	Mechanic	02
5	Driver	03

6	Handymen	06
	TOTAL	13

About COPWASTE's Operations

COPWASTE's core business is non-hazardous solid waste collection. At the time of conducting the research, the company owned 05 pieces of specialized waste collection equipment; 04 skip loaders and 01 compactor and 02 non-runner utility vehicles. The 04 skip loaders were a gift from the Government of the Republic of Zambia through the line ministry, Ministry of Local Government and Infrastructure. These were donated to the company in 2018 and 2019 respectively. Fig 13 below is a depiction of one of the skip loaders donated in 2019, pictured at Helen Dumpsite, Chingola.

FIGURE 13: SKIP LOADER AT THE DUMPSITE PHOTO CREDIT: RESEARCHER

The company had a standard mode of operation that is replicated across all the divisions. This operational model had been in use since 2007. For residential clients, the first step is for them to pay for the preferred type of service from any of the

company's pay points. At pay points, the client is issued with a payment receipt and bin liners equivalent to what they have paid for. For Ndeke residents, the closest pay point is located at Kabala in Nkana East. This is an average of about 8km distance for the residents of Ndeke Presidential residents.

The operational crew is given a routing, which is typically a list of clients to be serviced on that particular day. The routing indicates the clients' names and addresses. The waste is packaged in receptacles provided by the company. The receptacles include 80l bin liners, 210l drums and 240l wheelie bins and 6m³ skip bins.

Fig 14: 210LColour Coded Drums Photo Credit: Researcher

Fig 15: 6m^3 Skip Bin Photo Credit: Researcher

In the case of Ndeke Presidential, the operational crew (driver, handymen) goes door -to-door collecting waste which has been placed outside the yards by the clients. Only waste packaged in the company's receptacles is collected.

FIG 16: WASTE OUTSIDE CLIENTS' YARD IN COPWASTE RECEPTACLES PHOTO CREDIT: RESEARCHER

In the month of November, 2023, the Ndeke Presidential clients' list averaged 417. When the truck is full, the crew dumps the waste at Ichimpe Dumpsite, which is approximately 20km away from Ndeke Presidential. After dumping, they go back and continue from where they left off till all the paid-up clients are serviced.

The respondents stated that for commercial clients, there were written contracts and Memoranda of Understanding (MOU) but for residential clients the obligation by the company begun when the client paid and ended when the service was rendered. The clients were expected to package the waste in the COPWASTE receptacles which are either green or red and not anything else. COPWASTE also expects the clients to place their waste outside their yard on the day of collection. The respondents indicated that the subscription numbers were low. A slight increase in subscription levels is noted during the rainy season. This is due to the fact that burning of wet waste is difficult and flies increase in numbers in yards that have pits for disposal of waste.

The respondents informed the researcher that the collection day for Ndeke Presidential was Saturday but due to equipment sharing across the divisions, waste is rarely collected on the actual set day. In such a scenario, the clients are advised through a WhatsApp group as to when the collection of waste will take place. The respondents stated that this mode of communication is however not so effective as the WhatsApp group contained about 480 participants. Those included clients from all areas that the company has operations in, in Kitwe. The respondents indicated that Kitwe had about one thousand six hundred fourty three (1,643) residential clients.

The company's complaints management system begins with the receiving of a complaint from the aggrieved client. This is recorded in a complaints book (client's name, address, contact information and complaint). The complaint is then forwarded to the responsible department. Depending on the nature of the complaint, resolution may be anything between immediate to a maximum of fourteen (14) days. The

department that received the complaint will then make a follow-up with the client to ensure the complaint is resolved.

5.12 ABOUT POLICIES & REGULATIONS

The respondents guided that COPWASTE was formed when there were only borrowed pieces of legislation from various acts such as the Local Authorities Act, Public Health Act and Environmental Protection and Pollution Control Act (EPPCA) and later Environmental Management Act (EMA). With the enactment of the Solid Waste Regulation & Management Act (2018), COPWASTE has started the process of aligning itself to the new law by reviewing its Articles of Association (AoA) as well as reviewing the organizational structure.

At the time of conducting the research, the company did not possess valid collection, transportation and disposal licenses as the company was under- going restructuring. The respondents indicated that they had not had a board since 2012. In the absence of the board, the Managing Director reports to the Permanent Secretary of the Ministry of Local Government & Infrastructure. The local authorities are shareholders but have not had an active role in the management and decisions of the company. The respondents also indicated that the company has a Standard Operating Procedure (SOP) which was implemented in 2015 and revised in 2019, a Business Plan covering 2023 to 2024 and a Business Strategy.

Challenges Faced by COPWASTE

The respondents guided that the challenges the company experienced included high down time due to equipment break-down. Poor road network in Ndeke Presidential highly contributes to equipment break-downs.

Another challenge cited was few and aged waste collection equipment. The respondents indicated that the company's only compactor has been in operation from the inception of the COPWASTE while the four skip loaders were donate by the government in 2018 and 2019 respectively.

The number of people willing to subscribe and pay for waste management is quite low. Most residents of Ndeke are still engaging in alternative waste disposal methods such as indiscriminate dumping, burning and by digging pits in their yards. The respondents also stated that the company has high financial liabilities such as unpaid suppliers of goods and services. The setting up of franchise companies by local authorities to operate along side COPWASTE was another challenge cited.

Recommendations on How SWM can be Improved

The respondents stated that the company would perform better if the following recommendations were considered;

- company needed to be re-aligned to the Solid Waste Regulation and Management Act (2018) and supported as per the act.
- The company needed more support from the shareholders, that is the local authorities. The pitting of the company against franchise waste collection companies was not helpful in the sustenance of the company.
- The company needed the line ministry to expedite the restructuring process as well.
- In the interim, while awaiting the completion of the structuring process, management needed to devise ways for the company to acquire new operational equipment as well as revamping the run - down trucks and utility vehicles.

RESULTS FROM RESEARCHER'S FIELD VISITS

The researcher spent some time in the field while the COPWASTE crew was working. This was for purposes of familiarizing the researcher with the actual operations of the company. The researcher wanted to understand how the company's SWMS is actualised.

On the days when the researcher worked with the operations crew (the operations crew is comprised of a driver and 02 handymen), the waste collection truck or

compactor left the workshop between 7:30hrs and 8:00hrs. This was after the mechanical team, headed by the Workshop Foreman had checked the truck and certified it fit for the days work. The Technical Officer (TO) then supplied the routing to the operations crew and mapped out a strategy of work with them. The routing would have been prepared the previous day by the Commercial and Sales Department and given to the Operations Department. The operations crew together with the TO, would leave for the filling station. The driver and the TO would sign off for the fuel drawn and proceed for the day's collection schedule. The TO would return to the office.

In Ndeke Presidential area, the operations crew went from client – to – client according to the routing. It was noted that most clients had extra waste which was not packaged in COPWASTE receptacles. At other homes, the researcher observed that even though none of the waste was in the company's branded receptacles, the operations crew still collected the waste after receiving a payment. The operations crew also went off the routing to collect waste from their own established clients. The researcher observed and confirmed that these monies collected during field operations by the operations crew was not declared to the company. The driver shared the money with his handymen and on two particular occasions, the researcher was also a beneficiary.

After working for about 4 hours, collecting about 400 liners of waste, the compactor would fill up and the operations crew would proceed to Ichimpe dumpsite for disposal of the waste. The trip from Ndeke Presidential Area to the dumpsite and back would take about 90 minutes to 120minutes. At the dumpsite, the road would only allow one truck into the dumpsite. Therefore, when the operations crew got to the dumpsite, they had to wait for a minimum of 10 minutes for each truck to go in and dump the waste. None specialized waste collection trucks such as canters would take even longer as the waste had to be emptied manually from the truck. On one particular day when the researcher worked on the truck, the COPWASTE truck was fourth in line at the dumpsite.

Upon leaving the dumpsite, the operations crew ventured into industrial area for their lunch break which would take a minimum of 1 hour. Back to Ndeke Presidential area around 15 hours, the operations crew would continue with the work. The driver would mark all the clients serviced on the routing and indicate reasons for non – service for those not serviced such as no waste, no COPWASTE liners and so forth. All the clients on the routing would be serviced by about 16:30 hours and the operations crew would go back to the workshop and park the truck with the waste. If they decided to go to the dumpsite at that time, they would get to the workshop after dark.

On getting to the workshop, the marked routing would be handed back to the TO. The crew would then take their showers and disperse. The cycle would commence the following day with a different area. In cases where there is a break-down, the crew would either drive back to the workshop or the mechanical services unit would follow the truck. Servicing of clients would continue upon rectification of the fault as the company has no trucks on stand-by. Down time would range from minutes to hours to days.

Documents Reviewed

The researcher was availed with the SOP for the company, marked routings for Ndeke Presidential for the month of October and November 2023, log books for the trucks, the company's Business Strategy, the company's Business Plan and the AoA, both the current and the draft copy. The company has displayed the mission statement, the vision and the company's values in the various offices. The company has however, no written and displayed complaints handling procedure.

CONCLUSION

In the above Chapter, data collected from questionnaires as well as from KII of officers from KCC and employees of COPWASTE were presented and analysed in form of charts, graphs and statements. This Chapter is a manifestation of the work of the previous chapters and is the end of field studies.

CHAPTER 5

6.0 DISCUSSION OF FINDINGS

6.1 INTRODUCTION

The Discussion of the Findings chapter is very critical to any research as it explains the meaning of the results obtained during data collection. Hess (2023) guided that the purpose of the discussion chapter or section of a research was to explain the connotation of the results to the reader and that the extra care should be taken to ensure the chapter is written in a way to help the reader understand the study. In this chapter, the researcher tried to explore the meaning of the data presented in Chapter 4 of the Research Report with particular focus on the four (04) objectives and research questions of the study.

6.2 CALIBRE OF RESIDENTIAL RESPONDENTS

The results obtained showed that most of the households that participated in the study are male headed as evidenced in Fig 4 which had a 56% bias of male respondents in the age range of 30 -39 with household incomes ranging between K5,000 and K10,000. 63% of the respondents had attained a minimum of a degree and had been subscribing to COPWASTE services for one (01) to three (03) years. The respondents' characteristics gave a reasonable level of confidence to the researcher to analyse and interpret the results.

6.3 KNOWLEDGE LEVELS OF RESPONDENTS

Having established the calibre of residential respondents, it was equally important to understand how conversant the residential respondents or participants were with regards to SWM as this informs their attitudes and practices towards SWM. All the respondents indicated that before subscribing to COPWASTE as their SWM service provider, they were either burning or burying the waste. The respondents sort another way of solid waste disposal because the method they were using was not meeting their SWM needs.

All the respondents indicated that though they are aware of the benefits of waste separation, they do not separate their waste into the various waste components such as plastic, paper, bottles, cans and food waste. They felt there was no need to go through the trouble as the waste was hauled by one truck.

The qualification levels of the respondents were also an indication that the respondents were able to grasp the basic concepts, analyse and chart the best way forward for themselves regarding SWM. Generally, the higher the qualification, the higher the knowledge levels. Pratama (2015) grounds this assertion when he postulated that people's level of knowledge is as a result of external and internal factors such as age, experiences and education.

6.4 ESTABLISHING THE PRESENCE OF COPWASTE SERVICES IN NDEKE PRESIDENTIAL AREA

The researcher's sampling design already used a purposive style which targeted COPWASTE clients. This was equally confirmed by the respondents themselves when they stated that they subscribed to the company as indicated in Fig 8. They went further to provide information of the company's operations in Ndeke presidential area such as the frequency of waste collection as well as the days when the service is provided.

The respondents from the company indicated that there were waste collection services provided in the area as well. This was evidenced by the provision of a routing which had the addresses and names of clients as well as the number of waste bags/liners collected from each household. The presence of COPWASTE was also independently confirmed by the officers from the local authority (KCC). The study therefore established that COPWASTE does indeed provide waste collection services in the area of interest and has a waste management system in place.

Having a SWMS in place is one thing. Having an effective SWMS is another. The effectiveness of COPWASTE's SWMS should be characterized by quality and timely service delivery which is manifested through the clients' responses such as willingness to continue subscribing to the service, satisfaction levels as well as an

improvement in the solid waste situation in Ndeke Presidential. Filemon (2008) advised that each community must evolve its own system which takes into account the quantity and character of waste, financial capability and technical expertise. Of great importance to running a good SWS is the availability of a skilled workforce. Figs 10, 11 and 12 indicated that the solid waste management system being used had a number of loopholes rendering it ineffective. If on the other hand, the loopholes can be addressed, the system's efficiency and effective levels would increase significantly.

6.5 ESTABLISHING THE GUIDING POLICIES AND REGULATIONS FOR COPWASTE SWMS

COPWASTE has an established SWMS that is basically -Collect – Transport – Dispose-. This system was established in 2007 at the inception of the company and was in use even during the time of the research. The respondents from the company had asserted that up until 2018, there was no concrete or stand-alone legislation that guided the management and regulation of solid waste. The policies were therefore formed in alignment with the borrowed pieces of legislation from Acts such as The Public Health Act, The EPPCA and later the EMA to name but a few. The 2018 Solid Waste Regulation & Management Act offered proper guidance as to how solid waste should be managed. The company then began the process of re-alignment to the prevailing legislation in 2019 by reviewing the AoA. By the time of the study, the AoA draft had been done and was awaiting approval by the line ministry, Ministry of Local Government and Infrastructure. The company was in essence therefore, still operating using policies that were instituted when the company was formed.

The SOP provided by the company gave a guide as to the operational safety procedures, at the offices, worksops and in the field. It detailed safety operational practices and measures to be undertaken by the Mechanical services unit in the workshops during repairs of the trucks and vehicles. It also detailed safety

procedures for the operational crew in the field such as signaling and communication between the driver and handymen.

The Business Strategy and Business Plan showed the plans management had for sustaining the company up to 2026. Management postulated that there would be a 20% business and revenue growth in 2024. The company had however not detailed how this would come about and what they would do differently. Therefore, the researcher could not establish how the growth would ensue. The KCC had indicated that the company needed to consider Private Public Partnerships (PPPs), accessing some government guaranteed loans and green funding in form of grants. The Finance Manager from the company when asked if they were considering any such sources of funding indicated that they could only consider that if they had audited accounts. He indicated that they could not have the accounts audited as it was expensive and they were waiting for re-alignment.

The respondents from the company explained the Complaints Handling Procedure to the researcher but did not provide any written document to support their narration. Even though the company's mission statement and vision were clearly stated and displayed, it was difficult to establish what the guiding policies for COPWASTE were and where they were drawn from as the researcher was not provided with any documentation to support the information given by the respondents from the company as well as from the local authority.

It should be emphasized that waste management practices today are shifting towards prevention and reduction, being the preferred practices as compared to disposal. This is aimed at ensuring that very few waste materials should end up at the dumpsites. The waste management hierarchy (Stuey, 2006) gives the preferred options of waste management starting with the least preferred being disposal and the most preferred being prevention. Countries that have implemented programmes that support this hierarchy have been noted to be perfoming very well with regards to waste management. In Chapter 1, reference was made to Denmark being the cleanest country worldwide with the highest EPI. Denmark focusses highly on less

waste through better use of natural resources, more and better recycling and less plastics in their circular economy.

COPWASTE's SWMS of collect – transport – dispose makes sure all the waste that is collected is transported to the dumpsite and disposed off. This SWMS in no way supports the waste management hierarchy. If this system supported the waste management hierarchy, it would, with no doubt lead to the collapse of the company. In the current operational model that is in use, the company's revenue is realized from high subscription numbers. These subscribers do not separate or reduce their waste but give all their waste to COPWASTE to feed into their SWMS. The company therefore thrives when there is a lot of waste from its clients. On the other hand, the company does not have any deliberate policy to encourage waste separation, prevention or reduction from source. The company equally has no immediate plans to position itself in a way that supports and aligns to the new legislation. The company has no plans of setting up recycling centres, sorting bays or waste transfer stations. This SWMS is undoubtedly not environmentally friendly as it decreases the quality of ground water through leachates which eventually find their way in water bodies.

6.6 ASSESSING WHETHER COPWASTE IS UPHOLDING THE SERVICE LEVEL AGREEMENT (SLA)

Service Level Agreements (SLA) are a crucial component of any transaction. SLAs specify the service guarantees by the service provider and spells out what is expected from the client. They may take a verbal or written form. Marilly et. Al (2002) noted that SLA specifications as well as management are a vital discriminant in a service provider's package as a service provider is given an opportunity to show case various levels of service guarantees and set themselves apart from their competitors.

In Fig 10, the respondents were split in a perfect 50 – 50 on whether COPWASTE operates up to its SLA or not. 50% of the respondents were of the view that the company adheres to its agreements with clients while the 50% did not agree. Fig 11 showed that 10 of the respondents rated COPWASTE service delivery as bad

while 06 asserted that it was moderate to good. The company's perspective was that at times they do not collect waste on the agreed days and at agreed frequencies. Sometimes, Ndeke Presidential is serviced fortnightly. The KCC also collaborated this assertion by confirming that there have been a number of complaints about service delivery from Ndeke Presidential residents and also that the local authority had on several occasions stepped in to alleviate the situation by availing waste collection equipment for use to COPWASTE on several occasions. KCC also indicated that due to the complaints received, they had engaged franchise companies to work along side COPWASTE in Ndeke Presidential area in order to lessen the problem of waste management in the area.

The company attributed the lapse in operating up to the SLAs to the frequent equipment break-downs that the company experiences due to the bad state of the roads in Ndeke Presidential. One of the most frequent equipment failures was the breaking of springs which mostly results from bad road network and heavy loads. Another contributing factor to the incessant break- downs was the age of the equipment. The compactor had been in operation since 2007 and the respondents from the company had stated that its life span was estimated at a maximum of 07 years. The other four (04) skip loaders owned by the company were 04 and 05 years old respectively.

The company also attributed their lapse in delivering the expected quality of the service to low operating income as a result of attitudes that Ndeke Presidential residents have towards spending money on garbage collection services. The company's assertion is supported by Ntambo (2020) who concluded that private WMS providers had many challenges in delivering a quality service due to competition with unlicensed service providers, bad road network leading to high down time of waste collection equipment as a result of frequent break-downs.

Despite the company respondents citing the above stated reasons for the lapses in service to Ndeke Presidential area, the researcher also noted that the number of equipment that the company possessed was not adequate to provide a satisfactory service. The company was sharing the compactor between Chingola and Kitwe.

This therefore entailed that if there was a break-down, then the whole schedule would be messed up as the company had no stand-by or swing truck. This would result in backlogs of uncollected solid waste.

Another observation by the researcher that was impacting negatively on the service delivery to clients was the abuse of the meagre resources by the operations crew. They were collecting waste from households that do not subscribe to the company and pocketed the monies themselves. They also went off routing and had extended lunch hours. While the company is footing the high operational costs of diesel, spare parts and other running costs, the operational crew was also running their own parallel waste collection scheme. All this would be lessened if COPWASTE would review and re-align themselves to the current waste management needs. This would enable the company to develop and implement monitoring strategies such as on the spot supervisory field visits and tracking of trucks. During the time of research, the company had no utility vehicles and hence were unable to perform the field supervisory visits.

In summing up, considering all the factors discussed above and the perspectives from the various stakeholders, it is quite evident that COPWASTE has not been meeting its SLA with its clients.

6.7 STAKEHOLDERS INVOLVEMENT IN THE SWMS OF COPWASTE

For the sake of clarity, it is essential that the stakeholders of COPWASTE are listed though already identified in the conceptual framework. The company's main stakeholders include the clients serviced by the company, the shareholders, i.e. the 07 local authorities (in this study, the local authority of interest is KCC), civic leaders as well as the employees of COPWASTE.

The residents of Ndeke Presidential do not have a take in the operations of COPWASTE per say. Their involvement is limited to making payments for the service through the pay points and having their waste collected. During the study it was established that there were no formal or written contracts between the clients and the company. Terms and conditions of the service were spelt out verbally.

The KCC though being a shareholder equally does not partake in the decisions of SWM at COPWASTE. They indicated that the company does not submit returns to the local authority thereby making it difficult to fully assess the effectiveness of COPWASTE's services in Ndeke Presidential. Since the enactment of the Solid Waste Regulation and Management Act (2018), the local authorities give recommendations of companies and individuals wishing to perform waste management services in the district. These recommendations are then sent to the line ministry for further vetting and eventual issuance of operating licenses be it collection, transportation, disposal or self-service licenses. The local authority stated that COPWASTE had never undertaken such a process of operating in line with the law. The local authority was also of the view that if COPWASTE called for regular meetings for the shareholders, it would be easier to understand the challenges the company was facing and how to intervene.

The line ministry (Ministry of Local Government and Infrastructure) however, seems to have a more direct involvement in the SWMS of the company. This is evidenced by their granting of 04 skip loaders to COPWASTE. The respondents from the company had also stated that in the absence of the board, they report to the ministry.

6.8 CONCLUSION

In this chapter, we discussed the results of the study and tried to co-relate the initial questions that necessitated the study. We assessed whether the company was upholding the SLAs, the company's guiding policies, the involvement of stakeholders in the SWMS and the knowledge levels of the residential participants. All in all, the effectiveness of the SWMS of COPWASTE was assessed.

CHAPTER 6

7.0 CONCLUSIONS & RECOMMENDATIONS

7.1 INTRODUCTION

This chapter is the culmination of the study. It concludes the study and gives recommendations. It also suggests the focus of possible future studies on the effectiveness of SWMS in Zambia.

COPWASTE has been in operation since 2007 and has been employing the same SWMS of collect – transport – dispose. The system has never been reviewed and as such, is offering partial waste management solutions to the residents of Ndeke Presidential in Kitwe. According to Pires et. Al, (2019) a WCS has to be attractive, available, near and safe for citizens to use for it to be considered effective. The COPWASTE SWMS is not very attractive as the number of Ndeke Presidential residents subscribing for the service is low.

The SWMS is inconsistent as it is marred by irregular schedules of waste collection as well as system and management inefficiencies. This has been compounded by poor communication to residents thereby dirtying the Ndeke Presidential area if waste is uncollected on the scheduled days.

The company has the nearest pay point at Kabala in Nkana East and this does not make it easy for the residents of Ndeke Presidential to access the service. Despite employing the door-to-door collection system, residents need to have easy access to payment centres as this is the first step in accessing the service. This has enabled the perpetuation of vices such as the operations crew collecting money from unsubscribed residents.

The company has an SOP, business strategy, a mission statement and vision. All these have an aspect of the company's contribution to a cleaner environment. The company's failure, repetitively to provide a service to residents of Ndeke Presidential

within the stipulated time frame is a clear indication of bigger problems the company is facing and non-collection of waste on the expected days contributes to the unsafe environment.

The sharing of operational equipment from town to town also contributes to the poor service delivery that the residents of Ndeke Presidential receive from COPWASTE. This again points to the inadequate waste collection equipment that the company owns.

The researcher could not establish what role the founding local authorities who are shareholders play in the running of the company. The researcher could also not establish what role the line ministry plays in the running of the company. The company could not sate whether they were subject to government audits or independent audits. The researcher could only conclude that despite the company being a quasi -government institution, it was operating more or less like a private company that was answerable to no authority.

The above stated in this chapter and the discussions in the previous chapters lead the researcher to conclude that the SWMS being employed by COPWASTE is ineffective.

Further, it is the researcher's view that the current SWMS being used by COPWASTE is not responsive to the current SWM challenges. The researcher therefore advances the following recommendations;

1. The KCC should take on a more active role in chaperoning the operations of COPWASTE. It is the mandate of the local authority to provide waste collection services but in the event that they form a company to undertake the task on their behalf, they will only step in to provide relief services. The KCC therefore has every right and responsibility to find a long-term solution to the failing waste WMS.

2. COPWASTE services are essential but need to be in tandem with today's waste management challenges and solutions. The company therefore needs to complete its re-alignment process to the prevailing law, the Solid Waste Management and Regulation Act (2018) and formulate its policies accordingly.
3. The number of residents using formalized WMS systems in Ndeke Presidential is very low. The KCC needs to find ways of ensuring that residents subscribe to licensed waste management companies.
4. COPWASTE needs to operate within the confines of the law and therefore needs to have the necessary operating licenses.
5. Lusaka City Council has formed the Lusaka Integrated Solid Waste Management Company whose mandate is waste management. The company has since attracted some massive investment and making some good strides in SWM, case in point, the management of Chunga Dumpsite. The shareholders of COPWASTE can refine the company and reposition it for effective SWM.
6. The operational equipment that the company was running needed to be monitored a bit more closely to lessen going off routing and malingering by the operations crew. Monitoring systems such as Global Position System (GPS) would be helpful.
7. The revenue collection system needed particular attention as the company was sharing proceeds with employees. Further, due to low subscription numbers, the company could explore coupling, attaching or bundling their tariffs to essential services such as water, electricity or phone airtime to boost their revenue base.

7.2 SUGGESTIONS FOR FUTURE STUDIES

As this study has established that the current system being used by COPWASTE and the rest of the country, which is collect – transport – dispose is not very responsive to the current needs of the SWM, the researcher recommends that more work should be done on formulation of systems that promote the lessening of the quantity of waste that ends up at the dumpsites. More research may be

done in trying to see how the current SWMSs can be refined or all together abolished to set up systems that take into account the principles of the 05 Rs of solid waste management, that is Refuse, Reduce, Re-use, Reclaim and Recycle. These in turn support the principles of the waste management hierarchy namely prevention, minimization, re-use, recycling, energy recovery and disposal.

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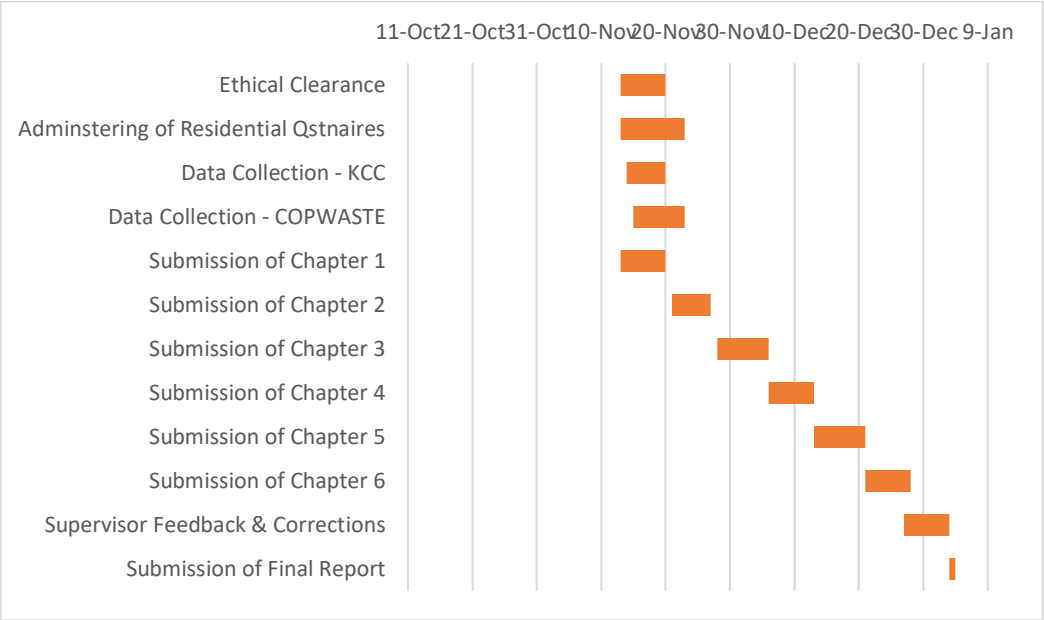
9.0 APPENDICES

APPENDIX I: Budget For the Research

Sn	Item Description	Qty	Unit	Total Cost (ZMW)
1	Stationary	1	1000	1000
2	10Gb Data Bundles	5	100	500
3	Petrol	60	30	1800
4	Talk Time	3	150	450
5	Contingency	1	700	700
	Total			**4,450.00**

APPENDIX II: WORKPLAN TIMEFRAME



Appendix III: Household Questionnaire

UNIVERSITY OF LUSAKA

SCHOOL OF POSTGRADUATE

Dear Sir/ Madam,

RESEARCH TITLE: **The effectiveness of solid waste management systems in Zambia: The Case of COPWASTE.**

I am a student at the University of Lusaka, pursuing a Master of Environmental Management. As part of the academic requirements, I am carrying out research on "The Effectiveness of Solid Waste Management Systems with COPWASTE as case study.

You have been randomly selected to participate in this stud., However, your participation is entirely on a voluntary basis. I am therefore requesting you to spare some time and fill in this questionnaire. The information you give will be treated with the highest confidentiality and will be anonymously used only for purposes of completing the research report.

Thanking you in advance for your cooperation.

INSTRUCTIONS

1. Answer the questions either by ticking the most appropriate response(s) in the spaces provided [√] or by writing down the answers in the spaces provided.

2. In case you need additional space, you can write on the reverse side of the paper or any convenient additional paper.
3. The information obtained will be treated with strictest confidence. You are therefore requested not to write your name or address or anything else on the questionnaire apart from the information being requested for.
4. Give clear and simple explanations to the questions which require explanations.

DATE OF INTERVIEW: ……. QUESTIONNAIRE NO……

SECTION A:

BACKGROUND INFORMATION (Please tick √ where applicable)

(1) Sex of the respondent

1) Male [ ] 2) Female [ ]

(2) Marital status

1) Single [ ] 2) Married [ ] 3) Divorced [ ]
4) Separated [ ] 5) Widowed [ ]

(3) Age Group

1) Below 19 [ ] 2) 20- 29 [ ] 3) 30- 39 [ ]
4) Above 40 [ ]

(4) What is the highest qualification you have attained?

1) Certificate [ ] 2) Diploma [ ] 3) Degree and above [ ] 4) None [ ]

SECTION B:

SOCIAL – ECONOMIC INFORMATION

(5) What is your current employment status?

1) Employed [ ] 2) Self-Employed [ ] 3) Unemployed [ ]

4) Other (Please specify)

……
……

(6) How many people are currently living in your house? Kindly specify the exact number

……
……

(7) Please state the household monthly income

1) Below K1,500 [ ] 2) K1,501 – K5,000 [ ]

3) K5,001 – K10,000 [ ] 4) K10,001 – K15, 000 [ ]
5) Over K15, 000 [ ]

SECTION C:

KNOWLEDGE, ATTITUDES AND VIEWS ON THE MANAGEMENT OF SOLID WASTES IN THE NDEKE PRESIDENTIAL AREA

(8) Do you subscribe to any solid waste management (SWM) company?

1) Yes [ ] 2) No [ ]

(9) If yes, which SWM company do you subscribe to?

……
……

10) How did you know about the SWM company you subscribe to?

1) Sensitisation by the SWM company [ ]

2) Sensitisation by the Kitwe City Council [ ]

3) Media [ ] 4) Friends/ Relatives [ ]

5) Local Leadership [ ] 6) Other [ ] (Please specify)

……
……

(11) When did you subscribe to the SWM company? Please specify the year.

……
……

(12) What method of solid waste disposal were you using before subscribing to the SWM company?

1) Burning [ ]

2) Burying it [ ]

3) Dumping it on the open areas [ ]

4) Collected by Kitwe City Council [ ]

5) Other [ ] (Please specify)

……
……

(13) If you said no to question (08), why haven't you subscribed to any SWM company?

……

……

……

(14) What type of contract do you have with the SWM company?

1) Written Contract [ ] 2) Verbal Contract [ ]

(15) Do you pay any fees for waste collection?

1) Yes [ ] 2) No [ ]

(16) If you said yes to question (15), how affordable is the current fee that the SWM company charges for waste collection?

1) Affordable [ ] 2) Relatively Affordable [ ] 3) Not Affordable [ ]

(17) If you said yes to question (15), does the company issue you a receipt after payment?

1) Yes [ ] 2) No [ ]

(18) If you said no to question (15), why don't you pay waste collection fees?

……

……

……

(19) How often does the SWM company collect your waste?

1)Daily [ ] 2) Weekly [ ] 3) Fortnightly [ ] 4) Other [ ] (Please Specify)

……

……

……

(20) Does the SWM company collect waste on the agreed day of collection?

1) Yes [ ] (Please skip to Q24) 2) No [ ]

(21) If you said no to question (20), please explain.

……

……

……

(22) Do they make up for not collecting waste on the agreed day? Please explain.

……

……

……

(23) Are you notified by the SWM company when there is a delay in waste collection?

1) Yes [ ] 2) No [ ]

(24) How does the SWM company collect the waste?

1) They pass through my home to collect [ ]

2) They have put communal bins where we throw the waste [ ]

3) Other (Please specify)

……

……

……

(25) Is there a limit of waste the SWM company collects from your house?

1) Yes [ ] 2) No [ ] (Please skip to Q27)

(26) If you said yes to question (25), please specify the Kgs/ Number of receptacles

……

……

……

(27) How would you rate the current waste management services provided by the SWM company to your home?

1) Very Good [ ] 2) Good [ ] 3) Moderate [ ]

4) Bad [ ] 5) Very Bad [ ]

(28) Do you segregate your waste?

1) Yes [ ] 2) No [ ]

29) Where do you store your waste?

1) Bins [ ] 2) Plastic bags [ ] 3) Dump outside [ ]

4) Bury [ ] 5) Other (Please specify)

……

……

……

(30) What type of vehicles does the SWM company use to collect waste from your home?

1) Specialised Waste Collection Vehicle [ ] 2) Open Van [ ]

2) Open Truck [ ] 3) Tipper [ ] 4) Other [ ] (Please specify)

……

……

……

(31) Is the waste well secured to avoid spillage when it is collected?

1) Yes [ ] 2) No [ ]

(32) Do you think the SWM company that collects waste in your residential area has improved the cleanliness of the surrounding?

1) Yes [ ] 2) No [ ]

(33) What (if any) do you think are the major factors affecting SWM in your area?

……

……

……

……

……

(34) What (if any) challenges do you face in SWM?

……

……

…….

……

……

(35) What (if any) challenges do you think the company faces in solid waste collection?

……

……

…….

……

……

(36) What do you think should be done to improve the management of solid waste in your area?

……

……

…….

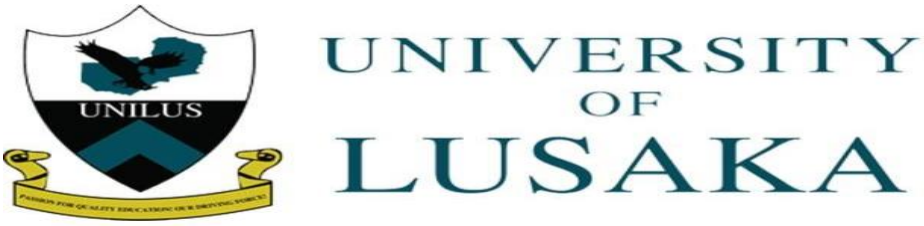
……

……

THE END

THANK YOU SO MUCH FOR YOUR TIME!

Appendix IV: Interview Guide for COPWASTE



SCHOOL OF POSTGRADUATE

RESEARCH TITLE: **The effectiveness of solid waste management systems in Zambia: The Case of COPWASTE.**

INSTRUCTIONS:

1. Introduce yourself

2. Explain purpose of the study

3. Assure respondent of confidentiality

4. Explain to the respondent that their participation in this study is entirely voluntary, the interview is not a test, there is no right or wrong answer and that respondents should feel free to provide accurate information to the best of their knowledge.

Interview Date: …… Time: ……

A. BACKGROUND INFORMATION

1. Name of Respondent:

2. Sex:

3. Age:

4. Position in Organization:

5. Name of Organization:

6. Physical Address:

7. Educational level:

8. How long have you been working in this institution?

9. Number of employees in the company:

10. Number of employees engaged in solid waste collection and disposal:

11. Number of permanent employees:

12. Number of casual employees:

13. Average age (years) of the staff involved in solid waste collection:

B. SOLID WASTE MANAGEMENT INFORMATION

1. How long has the company been involved in solid waste management services?

2. What is the method of waste collection? Is it house to house collection, communal collection using transfer stations, if other (specify)?

3. How many households do you offer solid waste management services to in Ndeke?

4. Are the contracts between you and your clients verbal or written?

5. What are your expectations of your clients and have you noted any positive trends/patterns from your clients?

6. How much waste do you collect per household and do you have a limit of waste to collect?

7. How much do you charge your clients?

8. What is the payment mode? Is it daily, weekly, monthly, quarterly, annually or other?

9. Do you experience any difficulties in collecting the fees from your clients?

10. How many vehicles are used for solid waste collection and disposal in your firm and are the vehicles owned by the firm or hired?

11. What type of vehicles are they?

12. What is the estimated waste (tonnes) collected and disposed off per week?

13. How many times in a week do you collect waste and which specific days do you collect the waste and time of collection in Ndeke?

14. Where do you dump the waste?

15. Do you have a complaints management system?

16. If yes, what is the complaints handling procedure?

17. What policies guide your SWMS?

18. Which legislation(s) guide your SWMS?

19. Do you have waste collection and transportation licences?

17. What challenges do you face in collecting waste?

16. What recommendations do you propose on how to improve solid waste management?

THANK YOU SO MUCH FOR YOUR TIME.

Appendix V: Interview Guide for the Local Authority (Kitwe City Council)

UNIVERSITY OF LUSAKA

SCHOOL OF POSTGRADUATE

RESEARCH TITLE: **The effectiveness of solid waste management systems in Zambia: The Case of COPWASTE.**

INSTRUCTIONS:

1. Introduce yourself

2. Explain purpose of the study

3. Assure respondent of confidentiality

4. Explain to the respondent that their participation in this study is entirely voluntary, the interview is not a test, there is no right or wrong answer and that respondents should feel free to provide accurate information to the best of their knowledge.

Date of Interview: ……. Time: ……

A. BACKGROUND INFORMATION

1. Name of Respondent:

2. Sex:

3. Age:

4. Position in Organization:

5. Name of Organization:

6. Physical Address:

7. Educational level:

8. How long have you been working in this institution?

B. SOLID WASTE MANAGEMENT INFORMATION

1. How and why was COPWASTE formed?

2. What SWMS does COPWASTE use to service the residents of Ndeke Presidential?

3. Does the SWMS for COPWASTE conform to the standards of Kitwe City Council?

4. How often do you monitor the operations of COPWASTE in Ndeke Presidential?

7. Does COPWASTE have service level agreements with it's clients?

8. Do you have a role to play in the setting of tariffs for COPWASTE?

9. Where does COPWASTE dump the waste it collects?

10. Does COPWASTE submit returns to the Local Authority?

9. What role do you think households have in solid waste management?

10. How would you describe the attitude of the public in general and that of the people

in Ndeke Presidential towards waste management?

11. What challenges do you think the COPWASTE faces in the provision of solid waste management services?

12. What are the main challenges Kitwe City Council faces in monitoring COPWASTE operations?

13. What recommendations would you give to COPWASTEon how they can improve their SWMS?

14. What do you think should be done to tackle this problem of SWM on a long term basis?

15. Anything else to add on what has been discussed?

THANK YOU SO MUCH FOR YOUR TIME.