UNIVERSITY OF LUSAKA

SCHOOL OF MEDICINE AND HEALTH SCIENCES

SOLID WASTE DISPOSAL AND MANAGEMENT PRACTICES IN THE CENTRAL BUSINESS DISTRICT OF LUSAKA, ZAMBIA.

BY

ROBERT CHIBESA

BSPH 18111196

SUPERVISOR

MR BROWN NGENDA

A Dissertation submitted to the University of Lusaka in partial fulfilment of the requirements of a Degree in Bachelor of Science in Public Health

2021

COPYRIGHT

DECLARATION

I (ROBERT CHIBESA) I hereby declare that the work offered in this study is for the Bachelor of Science in Public Health and has not been presented in whole or in part for any other degree or course. I also therefore solemnly certify that this report is solely the result of my independent research while studying at the University of Lusaka, and that all sources of information have been clearly identified in the document and in the references.

DEDICATION

This work is dedicated to my parents, Mr. and Mrs. Chibesa and brothers and sisters because they have always been there for me and without their spiritual and financial support, I would not have been able to complete my work may the Almighty God continue his blessings on you. God Bless You All.

ACKNOWLEDGEMENTS

Firstly, I thank God for helping me to compile this paper, for without him it wouldn't have been possible to bring this work to fruition.

Sincere appreciation goes to my supervisor Mr Brown Ngenda for his valuable contribution and guidance throughout the compilation and writing of this document. I would also want to express my heartfelt appreciation to my aunty Linda waleka Manda and Jacintha Mulenga who went above and beyond in supporting and aiding me with completing this study there assistance was vital in my completion of this research, and I will be eternally thankful to her.

I am very grateful to my devoted mother, Martha Mpokota, for her encouraging remarks and guidance to always put God first as I journey in this life and for always being my support system to that I say thank you.

I'd want to thank all of my classmates and friends that assisted me in making this project a success, especially Sukanzila.P.Munkonbwe and Steven.D. Phiri and members of staff at the University of Lusaka who supported me throughout my time there.

May God bless you all

PROOF OF APPROVAL BY SUPERVISOR

I BROWN NGENDA (supervisor name) approve the submission of research proposal/ dissertation for ROBERT CHIBESA (student name), for final review and marking.

Supervisor Sign: _____

Date: 03/01/2022

ABSTRACT

This study was conducted in the city of Lusaka in Lusaka province, the study aimed at assessing how solid waste was managed and disposed off by the local authorities. The study also looked at the effects or diseases that may arise due to the improper management and disposal of solid waste in the central business district of Lusaka. The indiscriminate disposal of waste, both liquid and solid, adversely affects the immediate human environment by degrading the natural phenomena hence, exerting health risk to exposed population. Health risks may be carried through different vehicles including flies, dogs, rodent and others that scavenge on the waste.

METHODS

The method that were used in this research was the case study and the study population was chosen using the simple random sampling technique which gave everyone that operates in the central business district an equal opportunity for being selected. The sample size that was used in this research was 30 participants.

RESULTS

The results in this research study show that the study population has knowledge on how solid waste is managed and disposed off in the central business district of Lusaka. Furthermore the results show that the local authorities face a lot of challenges due to lack of resources for the proper implementation of improved solid waste management and disposal practices in the central business district of Lusaka.

CONCLUSION

There is need to sensitize the members of the general public on the importance of proper solid waste management and disposal practices in order to reduce how much solid waste is generated in the central business district furthermore this gesture needs to be extended to production companies to take responsibility of the proper disposal methods of the waste products of their production process and also at the consumer level where the consumers need to educated on the best methods to dispose off the byproduct waste. Solid waste needs to be introduced in the school curriculums in order to have generations that are well aware of the importance of properly disposing of solid waste.

Contents

CHAPTER ONE

INTRODUCTION

Solid waste management is a systematic administration of activities that provide for the collection, source separation, storage, transportation, transfer, processing, treatment and disposal of solid waste**.** Domestic waste is waste, which is either solid or liquid generated in residential areas, commercial settings and institutions. Waste in general terms is defined as an unwanted as it is obviously undesirable. It is nevertheless an inevitable and inherent product of social, economic and cultural life. The indiscriminate disposal of waste, both liquid and solid, adversely affects the immediate human environment by degrading the natural phenomena hence, exerting health risk to exposed population. Health risks may be carried through different vehicles including flies, dogs, rodent and others that scavenge on the waste. There are many types of waste but the main focus of the article is to address disposal practices of solid and liquid waste. Solid waste can be categorized or classified into two namely, Inorganic solid waste which can be defined as solid matter that does not decompose at any rate. This category of waste matter may be combustible depending on the type of the nature of the material they constitute and organic solid waste which can be defined as wastes that are generally biodegradable and decompose in the process of which emits offensive and irritating smell when left unattended. (Esayas Alemayehu 2004).

1.1 STATEMENT OF THE PROBLEM

Due to improper solid and liquid waste disposal and management practices especially in developing countries like Zambia this poses a high risk to the health of the community members therefore this implies that if these waste are well managed well Open dump can contaminate water sources secondly this can cause contamination of food supply and cause food borne disease, thirdly Hospital and pathological wastes are potential disease carrying waste products thereby posing as high risk waste which needs proper disposal, fourthly where the Radioactive wastes apply these are highly dangerous kinds of waste fifthly if waste is poor disposed and managed It can create fire accident this mostly applies to those kinds of waste that are highly flammable, sixthly when waste is poor disposed of It can create nuisance: Bad odor, smoke, dust Aesthetical problem discomfort: sneezing, coughing and if in severe cases can lead to chronic health problems. These phenomena persist in developing countries and affect almost every one.

If household, industrial, or commercial wastes are not properly disposed, then the disease problems caused by pollution will still remain to be persistent in the environment. The disease commonly transmitted through mismanagement of solid waste may include but not only diseases such as Cholera, dysentery, diarrhea and typhoid are waste related. If waste was safely deposited, or treated and disposed most of the water borne diseases would have not been a problem. (N. Ejaz et al 2010).

1.2 JUSTIFICATION OF THE STUDY

Due to improper disposal and management of solid waste within the central business district of Lusaka this leads to flies breeding and this is directly linked with open solid waste dumps. During the field investigation it was observed that during summer the flies are increase in their population so rapidly due to these waste dumps and they are very effectual vectors that spread disease in the community. Dispersed solid waste from the illegal open dumps often blocks the drains and sewers as observed by the researcher, ultimately these blockages are creating flooding and unhygienic conditions in the city of Lusaka thereby creating high risk of disease outbreaks some of these diseases may include cholera (which has been mostly occurring within Lusaka), typhoid and diarrhea, furthermore associated to the above problems, blocked drains from mismanagement of solid waste causes flooding in the city. The researcher further noted that due to blocked drains are greatly supporting the mosquitoes breed and they are spreading the malaria and dengue diseases in the city of Lusaka. Different segregated solid waste materials, such as plastic bottles are not being properly cleaned or sterilized by local scavengers as they are reused for selling their traditional super shakes known as “munkoyo or chibwantu” therefore this poses as a high risk factor for disease onset as these unsterilized bottles may harbor some bacterial agents that could cause severe illness to the users. Proportion of food waste in open dumps and waste drains are providing an attractive shelter for rodents such as rats. It was also noted that these rats are spreading disease, damaging electrical cables and other materials especially in market places like the city market area in the central business district of Lusaka.

1.3 MAIN OBJECTIVE

To determine the solid waste disposal and management practices in the central business district of Lusaka Zambia.

1.4 SPECIFIC OBJECTIVES

1. To assess how effective solid waste disposal and management practices is in the central business district of Lusaka.

2. To determine what is being done to individuals and organizations found wanting of improper disposal practices of solid waste in the central business district of Lusaka.

3. To establish the alternative solid waste disposal and management practices that can be used in the central business district of Lusaka.

1.5 RESEARCH QUESTIONS

1. How is solid waste disposed and managed in the central business district of Lusaka?

2. What measures are being used for individuals and organizations that use improper disposal and management practices of solid waste in the central business district of Lusaka?

3. What is being done by the legal authorities to meet the growing demand of solid waste disposal and management in the central business district of Lusaka as the population is increasing?

4. What alternative methods are being used for the proper disposal of solid waste in the central business district of Lusaka?

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

This chapter serves to review, survey books, scholarly articles, and any other sources relevant and by so doing, provides a description, summary, and critical evaluation of literature that has been researched on by other authors to determine the strategies and methods that are used for solid waste management and disposal practices and also the problems and gaps identified the authors ranging from the global perspective, regional perspective and the national perspective.

2.1.1 Global perspectives of solid waste disposal and management

Solid waste management has become one of a major concern in environmental issues (Mazzanti & Zoboli, 2008). This is particularly true to urban areas where population is rapidly growing and amount of waste generated is increasing like never before (Kathiravale & Mohd Yunus, 2008). Current earth's population is 6.8 billion and it is estimated that almost half of this population lives in urban areas (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2009). Waste generation increase proportionally to this population number and income, creating the needs of effective management (Mazzanti & Zoboli, 2008). Urbanization and industrialization leads to new lifestyles and behavior which also affects waste composition from mainly organic to synthetic material that last longer such as plastics and other packaging material (Idris et al., 2004). E-waste that barely existed before was generated as much as 20-50 metric tons a year (UNEP, 2006). The management of waste become complex and the facilities provided cannot cope with the increasing demand and needs. Therefore, best approach need to be implemented immediately while considering environmental, social and economic aspects (Aye & Widjaya, 2006). The drivers of sustainable waste management were clarified by Agamuthu et al. (2009), which include human, economic, institutional and environment aspect. The study suggests that each driving group should be considered in local context as managing solid waste for a particular society may differ from the others.

For example, waste managers in Africa need to tackle some issues including, lack of data, insignificant financial resources, vast different of amount and waste types between urban and rural area, lack of technical and human resources, low level of awareness and cultural aversion towards waste (Couth & Trois, 2010). On the other hand, problems faced among Asian countries

differ with two distinct groups; developed and developing countries. While some of the countries are having specific national policy on solid waste management, some others experience problems such as increasing urban population, scarcity of land, services coverage area, inadequate resources and technology, and so on (Shekdar, 2009). The differences in managing solid waste not only vary between countries but also among areas in the same country. For instance, while Istanbul are having big improvement in their solid waste management with the establishment of transfer stations, sanitary landfills and methane recovery system, it does not reduce the problem in the Black Sea coast in Turkey. This is caused by the complex topography, weak administrative structures and the low local's income (Berkun et al., 2005).

The waste management system should be dynamic and continuous based on new insights and experiences (van de Klundert, 1999). For example, continuous assessment of current policy and regulatory framework of New Zealand indicated the lack of policies coordination, hazardous waste management, consistency, incentives and markets for recycled material, and cleaner production effort (Boyle, 2000). Thus, the improvement in policy is needed while it will also benefit the country. As an example, based from EU25 group, it was found that the generation of waste is increasing and is expected to continue for many years ahead. After the implementation of the new EU's policy in waste recovery and incineration, the amount of waste land filled has been decreasing slowly (Mazzanti & Zoboli, 2008). However, based from the data from developed countries, the actual amount of waste been land filled is actually decreasing as more waste are incinerated, composted or recycled. Looking at the positive angle, Lomborg (1998) believed that area needed is sufficient to cater the total amount of waste generated by the world, but the problem is the location since nobody wants to stay near landfills. He also reported that air from incinerators and groundwater near landfills today are cleaner and safer. Therefore, solid waste generation can be considered more of a political or social issue than others (Lomborg, 1998).

Economics and environmental aspects of waste disposal option are always the main issue in choosing the right technology (Aye & Widjaya, 2006; Daskalopoulos et al., 1997). Developed Asian countries such as Japan, South Korea and Singapore are on their way to eliminate land filling while some other Asian countries still have problems with open dumping (Agamuthu & Fauziah, 2010; Shekdar, 2009; Bai & Sutanto, 2002). Despite the development of many waste

disposal option, landfills remain the most prominent system applied worldwide (Shekdar, 2009; Hamer, 2003). Although a lot of improvement had been possible in the land filling system and the regulation on the type of waste that can be treated at landfill is stringent, most of landfills operated remain primitive (Hamer, 2003).

2.1.2 Regional perspective of solid waste disposal and management

Waste generation, both domestic and industrial, continues to increase world-wide in tandem with growth in consumption. In developed countries, per capita waste generation increased nearly three-fold over the last two decades, reaching a level five to six times higher than that in developing countries. With increases in populations and living standards, waste generation in developing countries is also increasing rapidly, and may double in volume in the current decade. If current trends continue, the world may see a five-fold increase in waste generation by the year 2025. A high proportion of the waste could be recycled by the urban poor generating income for themselves and protecting the environment. There is a need to develop an integrated approach where the public, private and community sectors work together to develop local solutions promoting sustainable solid waste management (African development bank (ADB) 2002).

Municipal solid waste management (MSWM) system in East Africa has changed from the colonial days in the 40s, 50s and early 60s when it was efficient because of the lower urban population and adequate resources (Okot-Okumu &Nyenje 2011) to the current status that displays inefficiencies. The centralized waste management system has evolved into the current management mixtures that include decentralized as well as the involvement of the private sector.

Until the late 1980s, solid waste management policies and programs in most African cities were formulated and implemented by government agencies without significant public participation. There were many problems in the overall management schemes for solid waste policies. The most often encountered problem was decentralized responsibility for various activities of waste management. Many cities have adopted a management system whereby waste collection was administered under the department of health; disposal was handled by the works' or mechanical engineering department; and the fleet was centrally maintained for all city vehicles by the works or mechanical engineering department (ADB, 2002).

In most developing countries it is the urban authorities that are responsible for waste management. Waste management is one of the most visible urban services whose effectiveness and sustainability serves as an indicator for good local governance, sound municipal management and successful urban reforms. Waste management therefore is a very good indicator of performance of a municipality (Okumu, 2012).

2.1.3 National perspective of solid waste disposal and management

Waste generated even in the home is usually diverse and needs to be held together in a receptacle until collection time is due. Storage should be on a short-term basis only and should prevent the waste from being released to the environment. In some conditions, improper storage could be deemed disposal and could trigger more stringent regulation of the waste (US EPA, 2008).

Due to the irregular generation of waste and in some cases not so efficient infrastructure in place for solid waste collection, it is essential for waste to be stored temporarily prior to collection.

The storage of wastes generated by households before collection and transportation to the dump site involves the use of various receptacles. These receptacles include polythene bags, propylene sacks, metal bins, and disposing waste into pits dug at the back of the house (Downmore et al., 2011). It is established that population growth greatly contributes to an increase in waste production. It has also been empirically established that waste generation has increased rapidly over the years (Martin, 2011).

The management of various types of waste has over the years been a very difficult and challenging issue. This difficulty has manifested itself in the perennial outbreak of diseases such as cholera, dysentery and pollution of water resources, air, soil or land contamination, proliferation of pests and vermin, and the loss of aesthetic beauty. Improvements are desired in waste management covering aspects of minimization of waste generation, collection, reuse, recycling, treatment and disposal. In this regard, the Government of the Republic of Zambia (GRZ) enacted legislation such as the Environmental Protection and Pollution Control Act (EPPCA) amended in 1999, Cap 204 of the Laws of Zambia, which established the Environmental Council of Zambia to provide for the control of activities related to

environmental protection. In 1993, regulations for the licensing of transporters of waste and operators of waste disposal sites came into effect whilst the regulations governing the control of hazardous waste were signed in 2001.

Waste disposal is a critical stage in solid waste management (SWM) as well as ensuring the waste is taken to the right disposal site. However, the most critical stage is waste treatment. Over recent years, the waste management unit (WMU) encountered a number of problems including inadequate disposal areas and unsustainable treatment methods such as failure to correctly carry out the sanitary landfill method at dumpsites, un-managed burning and uncontrolled burying of waste; the implications of burning, such as air pollution and production of poisonous gases, cannot be ignored. The practice goes further to increase prevalence of respiratory diseases by exposing people to the dangers posed by the explosion of spray cans when exposed to fire. Uncontrolled burying of waste too, could pollute the environment. Also, poor disposal of non-biodegradable wastes like plastics could be harmful to the environment. Zhang et al. (2011) argues that the environmental pollution by plastic wastes is now recognized widely to be a major environmental burden.

According to a research conducted by Hambulo (2014), the most common method for waste treatment in Lusaka city was land filling. This was conducted at Chunga Dumpsite. In land filling, a layer of waste would be leveled and covered with a thin layer of soil. For burying, the aim was decomposition of waste, although this could result into greenhouse effect. Greenhouse effect is one problem of poor waste disposal, but contamination through improper waste disposal is also problematic. Burning of waste without incinerators created air pollution and risked fire breakouts or explosions (Kasala 2014).

Collection of solid waste is currently being done by a variety of groups which comprises the private franchise contractors and the Lusaka city council under the solid waste department while other communities mobilize community resources and ferry the waste to the land fill. It has been noted that in CBD of Lusaka city the council collects solid waste using their compactor trucks and also the use of skip truck metal bins especially in markets and bus stations in this regard members of the markets and bus drivers contribute a certain amount which accounts for the expenses of solid waste collection and disposal, furthermore the council has placed plastic bins in some parts of the CBD which makes it easy for solid waste collection as the activity of

garbage collection is done on a daily basis this is according to a research conducted by Chibesa (2016).

Theoretical framework and Conceptual framework

2.2.1 Theoretical framework

The theoretical framework that will be used to determine the way individuals act the way they do and the impacts it has on the environment and the effects of the environment on the individuals in the process solid waste management and disposal is the **social-ecological theoretical model**. This model assumes that individual efforts to behavioral change is likely to succeed in a more supportive environment, this further states that human behavior is usually shaped by recurring patterns of activities that take place in our communities and organizations. Therefore with regards to solid waste management and disposal practices this theoretical model looks at 5 ways which influence behavior change with regards to the escalating solid waste management and disposal practices challenges in the central business district of Lusaka.

Individual: An individual's various traits and identities make up this level of the Social-Ecological Model. These characteristics have the capacity to influence how a person behaves. Age, education level, sexual orientation and economic status are some of the many attributes noted at this interval. These factors are important to consider when constructing public health strategies, as characteristics such as economic status are linked to an individual's ability to access healthcare. Putting into consideration to the factors above the social-ecological model would want to determine what efforts the individuals in the central business district of Lusaka are making to ensure that there is proper solid waste disposal and management in their area of business.

Interpersonal: The relationships and social networks that a person takes part in also have great potential to impact behaviors. Families, friends and traditions are key players at the interpersonal stage of the model (Poux, 2017), this would put into considerations what individual measures are being implemented to ensure the proper disposal and management of solid waste in the CBD of Lusaka.

Community: This level of the Social-Ecological Model focuses on the networks between organizations and institutions that make up the greater community. These associations include businesses and functions of the built environment such as the markets. Community structures are often important in determining how populations behave and what customs they uphold. It is important to understand the community level to determine where health behaviors originate (Poux, 2017), with reference solid waste disposal and management this would imply the leaders in charge of these communities and what measures are they putting in place for the proper management and disposal of waste generated within their operating areas.

Organizational: Organizations are instrumental in the development of behaviors as they often enforce behavior-determining regulations and restrictions. A school, for example, controls the dissemination of knowledge. This influence is significant when it comes to communicating information about safe health practices (Poux,2017), with regards to solid waste disposal management and disposal in the CBD of Lusaka city we would be looking at what strategies is the Lusaka city council putting in place for the proper solid waste management and disposal practices.

Policy Enabling Environment: Policies and laws that are instigated at local, national and global levels make up the broadest level of the Social-Ecological Model. These policies have the potential to impact large numbers of people (Poux, 2017). In this regard we would be looking at what measures have the Lusaka city council public health unit and the Zambia environmental management authority put in place to ensure the proper disposal and management of solid waste and what measures or policies are in place for those found wanting for the improper disposal and management of solid waste in the central business district of Lusaka.

The Social-Ecological Model is useful in the creation of sustainable solutions for at-risk individuals and societies. One approach to public health that considers many of the model's levels is the practice of social change communication (SCC). SCC allows individuals and communities to influence shaping fairer, healthier societies. Its use of the Social-Ecological Model ensures that the strategies it develops are implemented across society. Through SCC and other approaches, public health organizations are creating long-term solutions to the problems that plague individuals, societies and countries today. Only in understanding the numerous

factors that influence harmful behavior can experts hope to tackle such problems effectively (Poux, 2017).

2.2.2 Conceptual framework

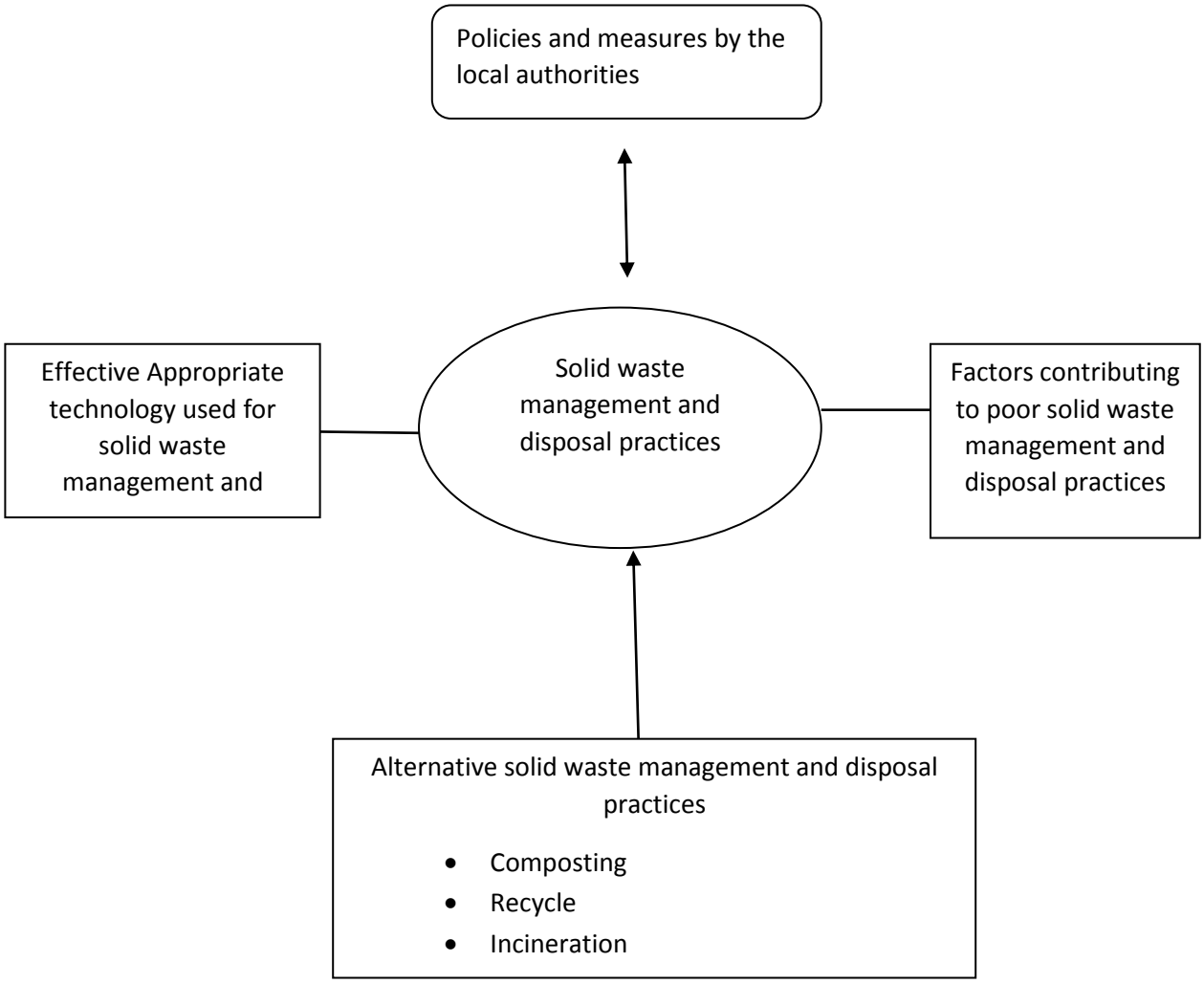

Figure 1solid waste management and disposal framework. Source: developed by the author

CHAPTER 3 METHODOLOGY

Introduction

In this chapter the researcher was describing the study design and the methodology that was used to collect data from people in the central business district of Lusaka, this includes the shop owners, the marketers, the staff from the Lusaka city council public health unit, the sub-contracted companies and the council workers assigned to manage and dispose waste in the central business district of Lusaka.

3.1 Research approach

This research used the qualitative research approach as using qualitative research approaches and methods simply because this approach produces the thick (detailed) description of participants' feelings, opinions, and experiences; and interprets the meanings of their actions (Denzin, 1989). Secondly qualitative research is an interdisciplinary field which encompasses a wider range of epistemological viewpoints, research methods, and interpretive techniques of understanding human experiences. Thirdly qualitative research enables the researchers to discover the participants' inner experience, and to figure out how meanings are shaped through and in culture (Corbin & Strauss, 2008). Fourthly during the data collection, the researchers interacted with the participants directly as it happened while data collection through interviews and as such data collection was subjective and detailed.

3.2 Research design

The research design that was used in this research is the case study sectional study, as this study intended to investigate the measures which had been put in place for those found wanting for improper solid waste disposal and management practices and it further assessed the alternative methods that had been adopted for the proper management and disposal of solid waste thirdly this study was used to determine how effective the solid waste management and disposal practices was in the CBD of Lusaka.

3.3 Research setting

This study was conducted in the central business district of Lusaka which was a highly dense populated business area as this is also regarded as the capital city of the country Zambia. This

area was chosen simply because it was the central business area and it was also the capital city therefore cross boarder roads pass through the central business district and the buyers and sellers from all over the country came to do business there hence the need to pay attention to the solid waste management and disposal practices.

3.4 Study Population/Sample size

The study population was derived from the central business district of Lusaka, which comprised of the marketers, shop owners, the sub-contracted companies that managed and disposed solid waste in the central business district of Lusaka, the staff of the Lusaka city council public health department unit and also some members of staff from the Zambia environmental management authority.

The sample size which was used in the research was 30 participants, this was due to data saturation (Data saturation refers to the point in the research process when no new information was being discovered in data analysis, and this redundancy signaled to the researcher that data collection needed to be ceased. Saturation means that a researcher can be reasonably assured that further data collection would yield similar results and serve to confirm emerging themes and conclusions). Furthermore due to insufficient funds and limited time allocated to the researcher to conduct the survey also contributed to the sample size population that was used in this research being reduced to 30 participants as sample size.

3.4.1 Inclusion criteria of the study population

The population that was included in this study comprised of the following:

1. marketers
2. shop owners
3. members of staff from the Lusaka city council public health unit for solid waste management and disposal
4. sub-contracted companies members of staff
5. Zambia environmental management authority members of staff

3.4.2 Exclusion criteria for the study population

The following population was not included in the study population:

1. Marketers outside the central business district of Lusaka
2. Shop owners outside the central business district of Lusaka
3. Sub-contracted companies that did not operate from the central business district of Lusaka

3.5 Sampling techniques

The sampling technique that was used to conduct this study was the simple random sampling technique. This sampling technique gave every member of the target population an equal chance of being selected and included in the study as a primary source of data which was going to be collected by the researcher.

3.6 Data collection techniques

The data collection technique that was used to collect primary data from the study participants was the questionnaire and in-depth interview guide.

The questionnaire

Questionnaires that were used in this study encompassed the closed format in order to collect qualitative primary information. The questionnaire is the primary tool for gathering data in survey analysis. Interviews and questionnaires are frequently misunderstood. In reality, the questionnaire entails a specific type of interview, a structured interaction, in which the dialogue is guided by the question wording and order of the instrument. The questionnaire is frequently given to all survey participants in a standardized manner.

In-depth interviews

In-depth interviewing is a qualitative research technique that involves conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation. The primary advantage of in-depth interviews is that they provide much more detailed information than what is available through other data collection methods, such as surveys (Boyce, 2006).

3.7 Data analysis

The primary data that was collected from the study population was analyzed through the use of different qualitative analysis methods which included;

Content analysis: This is one of the most common methods to analyze qualitative data. It is used to analyze documented information in the form of texts, media, or even physical items. Content analysis is usually used to analyze responses from interviewees. **Narrative analysis** was also used in this research survey to elaborate on the observations from the field during data collection furthermore narrative analysis focuses on using the experiences shared by people in the central business district on solid waste management and disposal practices which will help the researcher to determine the correlations that exists in solid waste management.

3.8 scientific rigor

In order to ensure that there was reliability in the process of conducting the research the researcher assured the study population that the information provided was confidential and that the primary information could only be obtained from them, secondly in order to ensure that researcher biasness was reduced blinding was used for the control of biasness. Thirdly the researcher will have an audit trial in a data base which will comprise of all the steps and procedures used in the research program and also the changes that may have been made in the research process.

3.9 Ethical considerations

The reassurance obviously raised a lot of ethical issues by invading people in their natural habitat and place of business or work, it was a well-known factor that research that involved people would interfere with their normal activities. This study, however, sought to deal or handle such issues by first ensuring that approval to conduct the research was done by the University of Lusaka ethics committee, and secondly, the names of the study participants were not revealed.

Thirdly before the commencement of the interview consent (see appendix 2) was obtained from the respondents , further more information collected from the respondents was treated with utmost confidentiality and that this information was purely for academic purposes as it is a partial requirement for the fulfillment to be awarded with a BSc in public health, the study participants had a choice whether to participate or not as it is entirely out of personal will, lastly but not the least there was no reward or incentives to be provided to the study participants as the research was for educational purposes only.

CHAPTER 4 RESULTS

4.1 INTRODUCTION

This chapter serves to discuss the findings or the results obtained from the conducted research interviews concerning solid waste management and disposal practices in the central business district of Lusaka and the findings are stated as below.

4.2 SOCIAL DEMOGRAPHIC CHARACTERISTICS OF RESPONDANTS

4.2.1 SEX OF RESPONDANTS

Table 1 participant's gender and percent.

GENDER	*NUMBER OF PARTICIPANTS*	*PERCENTAGE*
MALE	*18*	*60%*
FEMALE	*12*	*40%*
TOTAL	*30*	*100%*

The table above shows the statistics of gender and participants that where interviewed by the researcher therefore we can say that males participated more than the females in this study and the frequency as shown in the table male stands at 60% and the females at 40%.

4.2.2 THE HIGHEST LEVEL OF EDUCATION ATTAINED

Table 2 educational level and gender of participants

EDUCATIONAL LEVEL	*MALE*	*FEMALE*
PRIMARY	***3***	***6***
SECONDARY	***10***	***4***
TERTIARY	***5***	***2***
TOTAL	***18***	***12***

With reference to the above table the researcher can state that amongest the participants we can note that 3 males and 6 females had their educational level end at primary, secondly we have 10 males and 4 females who had their educational level end at secondary furthermore we note that we had 5 males and 2 females who had tertiary level qualifications in the research study.

4.3 AN ASSESSMENT ON HOW EFFECTIVE SOLID WASTE DISPOSAL AND MANAGEMENT PRACTICES IN THE CENTRAL BUSINESS DISTRICT

4.3.1 WHO COLLECTS SOLID WASTE IN THE CENTRAL BUSINESS DISTRICT OF LUSAKA AND WHERE IS IT TAKEN AFTER COLLECTION

The Lusaka city council is in charge of the proper solid waste management and disposal practices in the central business district of Lusaka;

‘‘……. *the Lusaka city council collects and manages solid waste every day in town center which is deposited at the main solid waste dumpsite at the chunga chingwere dumpsite where treatment of solid waste is done……’’ (Town Clark, civic center)*

In order to attain information members of the public that operate in the central business district where interviewed some of the responses where:

"……We do not know how much our landlords pay for the services of solid waste disposal which is done by the Lusaka city council……" (Study participant).

This was mostly the case in situations where one shop was used by different individuals doing different or simillar business endeavours as all that was required of them was to pay rentals and the landlords dealt with the bills of electricity and water, solid waste. Shop operaters further narrated that;

''…….We store our solid waste behind our stores because we have a residential area at the back of the building……''(study participant).

Some study panticipants narrated that;

''…….Once our garbage (solid waste) pilles up, we use the company vehicle to ferry the solid waste to the Lusaka city council dumpsite in chunga chingwere……'' (Study participant).

Chunga chingwere dumpsite (Lusaka)

Some of the interviewed shop salesman further narrated that;

‘‘……When our solid waste has pilled up some coreboys collect the waste in exchange for a chank of money from the shops salesman…….’’ (Study participant).

When they where further asked on how knowledgable they were about where the cowboys dumpud the waste they stated that;

‘‘……. I have no idea (little or no knowledge) of where the boys deposited the solid waste; I think they take it to the council pickup points…….’’ (Study participant).

The researcher also observed that in some places like bus stations had proper skip bins where the shopsales personal and resturents located in the bus stations depsite the solid waste, when when interviewed the bus drivers at kulimatour bus station narrated that;

‘‘……..Everyday we pay a sum of k25 for small buses and k50 for big buses (ROSA) to the council which is directed towards the maintainace of the bus station and the solid waste disposal and these skip bins are emptyed on a daily basis by the lusaka city council…….’’ (Study participant).

The drivers further mentioned what challenges they faced due to what may may be considered as poor planing and poor handling of solid waste.

‘‘…… During the rain season the bus station gets flooded because the drainages are blocked with solid waste and also the drainage system is poorly designed and once it is flooded our customers go to other stations to jump on buses…….’’ (Study participant).

Photo by study participant

4.3.2 HOW IS SOLID WASTE STORED BEFORE COLLECTION

The researcher further observed that solid waste was poorly managed before collection as the waste was just hipped in one position because of no availability of proper solid waste bins in the streets and it is very unfortunate that during the time of rain seasons the solid waste gets to be washed away by heavy down pour rains and this implies that the solid wastes end up being deposited in the drainages by runnning water which clogs up the drainages which leeds to flooding and also high risks of development of water borne related diseases in the central business district of lusaka. It was also observed by the researcher that the poor storage of solid waste posed as a high risk to habouring of rodents and as breeding ground for insects which is a high hazard for street venders and shopowners who sell food as these can cause food contamination.

There are some shop salesmen who where interviewed concerning solid waste management and disposal practices and they narrated that;

''…….. the waste that is mostly generated by the shops is boxes which we reuse to store some of our products and in an event when we have excess we sell the boxes to recycling companies that recycle boxes……..'' others narrated that; ''….. We burn the boxes and plastics when pilled up…..'' (Study participants).

The market traders who were interviewed narrated that;

''……. the solid waste generated in the markets is usually dumped in one location where the lusaka city council comes to collect using excavetors and tipper trucks, there is a council employee who does routine rounds collecting payments at every stand on a daily basis and this is regarded as the payment for the disposal services and maintainance purposes…..'' (Study participant).

The Lusaka city council has employed and deployed employees who ensure that the central business is kept clean these employee's duties is to sweep the streets of the central business district which help in the control of solid waste management and disposal. When members of the Lusaka city council where interviewed on solid waste disposal and management, they narrated that;

''……. it is a challenge for the council because waste is generated everyday but there is no accountability as to who disposes waste where and when because town is for everyone…..'' (Council worker).

4.3.3 HOW MANY TIMES IS SOLID WASTE PICKED FROM CENTRAL BUSINESS DISTRICT OF LUSAKA?

''…….Solid waste in the cbd is collected on a daily basis by the Lusaka city council this is done because the amount of solid waste that accumalates on a daily if left unattended to can led to serious disease outbreaks especially during the rain season as flies and rodents multiply and also waterborn diseases……'' as narrated by interviewed shopsales man.

4.3.4 WHAT DISEASES MAY ARISE DUE TO POOR SOLID WASTE MANAGEMENT

This section of this study was highlighting what diseases where associated to poor waste disposal and management practices in the central business district. It was narrated by most marketeers and shopsales men that the most occuring diseases that have frequently affected people's lives in Lusaka are as follows as mostly mentioned by the study popultion.

- CHOLERA: The study participants stated that;
  ''……..one of diseases that affect the CBD especially during the rain season is cholera….'' (Study participant). The participants further mentioned that;
  ''….. cholera is due to poor solid waste disposal practices as this lead to the solid waste materials being dumped in the drainages which ends up blocking the smooth flow of water causing flooding in the streets of CBD leading to high occurance of the spreading of the disease……''
  The participants went on and stated that;
  ''……. as marketeers we are highly at risk of developing the water bourne disease because we have little income and can not afford not conducting our daily business even when our trading area is at high risk of the disease as we have no other source of income…..''

The cholera bacterium is usually found in water or in foods that have been contaminated by feces (poop) from a person infected with cholera bacteria. Cholera is most likely to occur and spread in places with inadequate water treatment, poor sanitation, and inadequate hygiene. Cholera is an acute, diarrheal illness caused by infection of the intestine with the toxigenic bacterium *Vibrio cholerae* serogroup O1 or O139. An estimated 2.9 million cases and 95,000 deaths occur each year around the world. The infection is often mild or without symptoms, but can be severe. Approximately 1 in 10 people who get sick with cholera will develop severe symptoms such as watery diarrhea, vomiting, and leg cramps. In these people, rapid loss of body fluids leads to dehydration and shock. Without treatment, death can occur within hours (CDC).

- TYPHOID: It was further highlighted by the study population that some participants had at some point been diagnosed with the typhoid disease. They narrated that;

  ''…….. in town we have selected points where you can find toilets as a result of the use of public toilets at the market places which are not well cleaned and also the use of council water for drinking ……..'' (Study participant).

  The typhoid infection is often passed on through contaminated food and drinking water, and it is more prevalent in places where handwashing is less frequent. It can also be passed on by carriers who do not know they carry the bacteria (medical news)].

- RESPIRATORY TRACK INFECTION: The study participants narrated that they where prone to respiratory track infections.

  ''…….. due to the bad odours that come from the dump sites of the solid waste within the CBD awaiting collection by the local authorities, it is native of these dumping sites having fire from the waste coming from resturants which consists of charcoal which has not been properly put off which causes smoke leading to air pollution and we end up developing coughs and sore throats for our unfortunate friends who are asthmatic it is a challenge……..''(Study participants).

  Respiratory tract infections can be defined as any infectious disease of the upper or lower respiratory tract. Upper respiratory tract infections (URTIs) include the common cold, laryngitis, pharyngitis/tonsillitis, acute rhinitis, acute rhinosinusitis and acute otitis media. Lower respiratory tract infections (LRTIs) include acute bronchitis, bronchiolitis, pneumonia and tracheitis (NCBI).

- DIARRHEA: Diarrhea is one of the most common health complaints by the study participants. The participants stated that;

  ''…….the temporal dumping site where the waste is disposed of awaiting to be collected by the local authourites act as breeding grounds for rodents and insects especially flies and cockroches which are mostly coulprits of causing diarrheal diseases……..'' (Study participants).

  Diarrhea can range from a mild, temporary condition to a potentially life threatening one. Globally, an estimated 2 billion cases of diarrheal disease occur each year. Also, around 1.9 million children under the age of 5 years mostly in developing countries die from diarrhea every year. This makes it the second leading cause of death in this age group (medical news).

4.4 KNOWLEDGE OF WHAT IS DONE TO INDIVIDUALS OR ORGANISATIONS FOUND WANTING OF IMPROPER SOLID WASTE DISPOSAL IN THE CENTRAL BUSINESS DISTRICT

This section of the research seeks to highlight what consequences and sanctions have been employed by relevant authorities and the local authorities with regards to would be offenders to improper disposal of solid waste. When the study population was interviewed about the knowledge of what sanctions were taken on individuals that are found wanting for improper solid waste disposal the study population responded and the following was noted:

''…….An occupier or owner shall clean or cause to be cleaned the area around the owner's or occupier's property or other premise within the owner's or occupier's control……..''(Study participant, Lusaka city council, civic center).

''……. A person shall not place or dump, cause or permit to be placed or dumped on, at the frontage of a property or any other premises, solid waste, other than for purposes of enabling the convenient collection of the solid waste by a local authority and a solid waste management company, licensed solid waste service provider or self-service solid waste provider…….'' (Study participant, Lusaka city council, civic center).

''……Where solid waste is abandoned on private property or premise, an authorised officer shall notify the owner or occupier of the legal consequences of keeping the solid waste at the property or premise and the owner or occupier shall cause the solid waste to be disposed of, within seven days from the date of the notice, in a manner that may be directed by the authorised officer…….'' (Study participant, Lusaka city council, civic center).

''…….Where solid waste is found abandoned in a public place, an authorised officer shall take immediate steps to remove the solid waste and dispose of it in an appropriate manner……'' (Study participant, Lusaka city council, civic center).

4.5 ALTERNATIVE SOLID WASTE DISPOSAL AND MANAGEMENT PRACTICES IN THE CENTRAL BUSINESS DISTRICT.

This section of the research seeks to highlight the alternative methods of solid waste disposal practices and management in the central business district of Lusaka that have been employed. When the study population was asked about the alternative methods of disposal of the solid waste which they generate when conducting their everyday activities in the central business district, the respondents narrated that;

''..... Aside from the local authorities methods of disposal there is no alternative means of disposal for the generated waste.....'' (Study participant).

The participants further stated that;

''..... It is against the regulations to dig a pit for disposal of solid waste in the central business district.....'' (Study participants).

The participants narrated that;

''.....even if we wanted to use other means of getting rid of the waste by means of methods like burning, the local authorities charge us for pollution and also putting other people's property at risk of catching fire which leads to more expenses.....'' It was further narrated that; *''..... The only alternative means of disposal we have is recycling for those that generate recyclable waste....."(Study participants).*

CHAPTER 5 DISCUSSION

5.1 INTRODUCTION

This chapter serves to discuss the results of the research with regards to the research objectives

5.2 EFFECTIVE SOLID WASTE DISPOSAL AND MANAGEMENT PRACTICES

The assessment of how effective solid waste disposal and management practices is in the central business of Lusaka it was observed that the Council faced a number of obstacles as it attempted to process garbage at the dumpsite in a sustainable manner. For starters, the failure of certain members of the public to pay for trash management services has forced the Council and businesses to operate with little to no funding for employees, machinery, maintenance, and transportation. Illegal rubbish collection and disposal was also a problem. Illegal trash collectors have a tendency to gather rubbish from individuals and deposit it in non-approved waste disposal places, causing financial hardship for the City Council, which was in charge of garbage management in the city, including the collecting of improperly discarded rubbish due to the Council's inability to bring claims for improperly deposited rubbish or recover cash collected by illegal collectors, the Council's activities was hampered even more.

Palczynski states that based on the literature data it has been confirmed that urban governments in many African countries are facing serious problems with the management of solid waste. Solutions developed for the North are often not appropriate to contexts in the South. Social relations characterizing primary waste collection in African cities have certain particularities and therefore the potential social impact of changes resulting from the introduction of new waste management methods need to be carefully considered. Solid waste management in most countries is characterized by inefficient collection methods, insufficient coverage of the collection system and improper disposal of municipal solid wastes.

Monitoring subcontracted firms to aid in SWM in terms of the rate of Lusaka's growth and expansion was also a difficulty. Solid waste regions are divided into catchments, which are zones and districts. The Council regulates garbage collection, disposal, and management through smaller portions known as catchments. However, certain places, particularly unplanned

settlements, are big and overcrowded, making effective monitoring a significant challenge for the Council. Finally, there were not enough garbage collection trucks. The Council's ability to conduct inspections of subcontracted firms was further hampered by a shortage of transportation.

R.J Palczynski further states that since the privatization of all or parts of many municipal solid waste systems will take place in the coming years, privatization mechanisms should be implemented by involving those who are amongst the poorest and who potentially would be most disadvantaged by such changes. In order to be successful and sustainable, any future investments in equipment and in technology must be preceded by background studies and surveys of the solid waste management situation to assure that the use of means is best suited to the capabilities of the countries and their people. Education and communication channels between sectors, especially government and civil society, are considered to be inefficient and inadequate. A lack of a right to know, secrecy and misinformation has also been major contributory factors to poor waste management practices in many African countries. It has been seen that most community initiatives operate up to the stage of primary collection. Community contributions to small area based organizations; informal payments to municipal sweepers etc. exist because the community needs a regular and reliable primary collection system and does not like to see waste in the immediate vicinity.

The Council's most common waste treatment method was landfilling. Due to equipment failure, this had not been carried out effectively for the previous three years. As a result, the landfilling equipment that was supposed to compact the waste by covering it with soil to prevent the breeding of insects and other dangerous diseases, as well as reduce the area occupied by waste, was unable to function. Another treatment method used at the dumpsite that used incineration was burning. At the site, there was a fairly large, traditional incinerator where expired goods, chemicals, or hazardous substances were burned. Incineration was typically used for goods that were deemed harmful to society.

5.3 WHAT IS BEING DONE TO INDIVIDUALS OR ORGANIZATIONS FOUND WANTING FOR IMPROPER SOLID WASTE DISPOSAL

In order to determine what measures have been put in place for dealing with individuals who are found wanting with the laws of solid waste management process in the central business district of Lusaka the researcher referred to the act of 2018 solid waste disposal regulation and management act. The act states that a person or organisation found wanting by failing to comply with the standard prescribed in accordance with part [3] of the act commits an offence and liable to a conviction to a fine not exceeding three hundred thousand penalty units or to imprisonment for a period not exceeding 3 years or to both. It can further be stated that minimal measures have been put in place with regards to individual level as most of the regulations are more focused on industrial level. In order to be able to reduce the amount of solid waste we generate in the central business district long term planning measures need to be implemented directed towards the proper management and disposal practices of solid waste.

5.4 ALTERNATIVE SOLID WASTE DISPOSAL AND MANAGEMENT PRACTICES

There are various methods of solid waste alternatives that can be employed to ensure the sound management and disposal of solid waste in the central business district of Lusaka some of which include the following: The recycling of waste is a critical component of waste management.

JICA states that as a global trend, waste quantities generated in cities are on a steady rise due to rural-to-urban migration, quantitative expansion of consumption oriented lifestyles, and qualitative change of consumer goods (e.g. a wider use of plastic and packaging such as PET bottles, glass bottles and cans). Also increasing are wastes that are dangerous and difficult to dispose of, including contents of spray cans and infectious medical wastes. Developed countries now embrace the idea of extended producer responsibility (EPR) whereby producers assume a certain level of responsibility for their products even after they are disposed of as well as during their production and use stages-as one of the basic principles of solid waste management. These countries are developing laws and systems to put the principle into practice. In developing countries, however, this principle is not yet commonly accepted. To make matters worse, materials collected as wastes in developed countries are sometimes exported to developing countries as used goods.

Recycling is the use of discarded material to make another product of the same or lower grade. The following actions have been taken to improve and promote recycling measures/strategies must be implemented. The following actions and measures/strategies will be implemented to improve recycling and reuse:

• Improving waste characterisation and separation at the point of generation

• Implementing incentives

• Enhanced environmental reporting

• Creation of legislation to hold producers accountable for their products.

• A database of recyclable products must be created.

• Promote the reclamation of mining waste.

Source Reduction and Reuse Source reduction, also known as waste prevention, refers to reducing the amount of waste generated. Reducing waste at the source is the most environmentally preferred strategy (U.S. EPA 2017f). Individuals can reduce the amount of waste they generate by purchasing long-lasting and reusable products, or seeking out products that have been designed with waste reduction in mind this is important because waste prevention avoids waste generation, it is the most cost-effective and preferred solid waste management activity. Preventing or minimizing waste conserves resources (e.g., by reducing collection and transportation costs), protects the environment, and prevents the release of greenhouse gases (U.S. EPA 2017f).

Energy Recovery Energy recovery is the conversion of non-recyclable materials into useable heat, electricity, or fuel through a variety of processes. This process is often called waste-to-energy. Converting non-recyclable materials into electricity and heat generates an energy source and reduces carbon emissions by offsetting the need for energy from fossil sources, and reduces methane generation from landfills (U.S. EPA 2017f). Waste-to-energy plants have a high upfront investment cost and are costly to operate and maintain. Additionally, toxic emissions from such units have to be controlled. When coupled with effective end-of-pipe air pollution controls (i.e., controls placed on a facility that treats gases before they enter the environment) and waste disposal techniques, these plants can potentially reduce both waste volumes and greenhouse gas

emissions (USAID 2018). However, adequate financing plans and effective pollution controls are key factors to consider before planning a waste-to-energy facility as a viable solid waste management option.

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter serves to discuss the conclusion and recommendations that can be employed by the Lusaka city council for effective and efficient solid waste disposal and management in the central business district of Lusaka, this can be attained when the Lusaka city council operates in conjunction with other departments and ministries of the government that can help facilitate these measures.

6.2 CONCLUSION

According to the study's findings, solid waste was treated at a very low rate. Observations from the Chunga dumpsite revealed that the landfill machinery was inoperable, allowing for crude dumping rather than use of the landfill technique the dumpsite was supposed to last about 25 years, but observations revealed otherwise. In its 13th year, it was nearly full. The issues that hampered an effective waste management system three major issues have been highlighted in the city of Lusaka: a scarcity of methods to increase more sustainable Waste treatment methods are in place because there is no waste separation at the source, there are insufficient funds, and there is a lack of equipment to carry out the landfill method on-site

The lack of vehicle standardization has been a major contributor to the equipment shortage. Inappropriate refuse collection vehicles and the Lusaka City Council's poor revenue collection system have also contributed to the deterioration of services in the city's refuse management. The government and the Council have stated their intention for landfill purposes, repair or purchase new machinery. Finally, a lack of political will played a significant role in the Lusaka's waste management situation is deteriorating. Waste management received less financial attention as a result the dumpsite was no longer treating waste as it should.

6.3 RECOMMENDATIONS

1. A lot needs to be done in order to improve the solid waste management and disposal practices in the central business district of Lusaka, this can be extended to stakeholder involvement who are interested in helping out attain improved solid waste management and disposal. It would also require community involvement so that the members of the public have the sense of ownership which would help in behaviour change in the solid waste management and disposal practices.
2. Economic considerations need to be taken into considerations where the relevant authorities need to ensure that enough resources are invested in the solid management and disposal methods because luck of resources is what strangles the operations of improved solid waste management and disposal practices.
3. Public sensitization; There is need to take up an educational role in sensitizing the members of the public on how best they can be able to dispose off solid waste and properly manage it at their homes and also working places. The education process can further be extended in schools where school going children can be educated on the importance of proper solid waste management and disposal practices.
4. To begin with, waste treatment would be a much simpler process if waste sorting and separation occurred at the source, particularly the household. This can be accomplished by introducing plastic bags or containers that clearly state the type of waste that should be placed in each container this can be achieved by cooperations between the Lusaka city council, recycling companies and members of the public that own businesses in the central business district of Lusaka.
5. Secondly, the government, Council, and Parliament and other stakeholders must ensure that the dumpsite's intended purpose is met.
6. New equipment needs to be acquired and it must be maintained on a regular basis this activity involves the government in collaboration with the Lusaka city council and also non-governmental organisations.

7. Educating people about garbage policies and enforcing garbage laws are also important, particularly those concerned with garbage collection, transportation, and disposal, should be linked with harsher penalties and charges, this can be attained through the Lusaka city council working in conjunction with the Zambia Environmental Management Authority, and also media houses that can help sensitize the members of the public on the importance of proper solid waste and management practices in the central business district of Lusaka Zambia.
8. The government should include a course on SWM and its effects on the environment in both primary and secondary schools, with a focus on the advantages of sustainable solid waste treatment and waste sorting from the start (homes, offices and schools), this can be attained if the Lusaka city council works in collaboration with the government under the ministry of education, curriculum development work hand in to ensure that school going people are educated on the importance and effects of improper solid waste and this would be a reform to attain better policies in decision making.

   Palczynski (2017), states that the key to changing SWM practice at the consumer level is to make the distinction between public awareness and public education. An informed public can do much to improve the effectiveness of municipal waste management programs. Public agencies engage in this education primarily through initiatives based in the departments of health and education. School children are given instruction in sanitation, which includes reference to the safe handling of human and household wastes. Community service organizations, in collaboration with the health department and international health organizations such as the World Health Organization, conduct training seminars on sanitation for women. Included in these seminars are segments on waste handling.
9. Finally, the Council and its constituents must link the solid waste collection fee to other public fees such as water or electricity. This would ensure that no one is exempted from paying waste management fees and would reduce waste collection from illegal collectors.

REFFERENCES

Solid waste management and disposal (online article) available from: https://www.researchgate.net [accessed on 19 March 2021].

Witpress 2021 (online webpage) available from: https://www.witpress.com [accessed on 22 March 2021].

Literature review chapter 2 (online article) available from: https://www.studentrepo.um.edu [accessed on 21 April 2021].

Municipal solid waste collection problems by Jeroem Belien et al 2011 November (online article) available from: https://www.researchgate.net [accessed on 21 April 2021].

Factors influencing solid waste management in the developing world (online article) by Jessica MacAllister 2015. Available from: https://www.ir.knust.edu.gh [accessed on 21 April 2021].

Solid waste in African countries (online article) by James Okot-Okumu available from: https://www.gcca.eu [accessed on 28 April 2021].

Community participation in municipal solid waste management (online article) by Jumanne Dandi Shaguluka Kalwani November 2009 available from: https://www.core.ac.uk [accessed on 28 April 2021].

Review on solid waste generation and management in sub-Saharan Africa (online article) by Ejroghene Kelly Orkhorhoro September 2019 available from: https://www.researchgate.net [accessed on29 April 2021].

Solid waste in Africa by Ibrahim Adebayo Bello et al (online article) May 2016 available from: https://www.longdom.org [accessed on 29 April 2021].

Solid waste management for Africa by Richard J. Palczynski July 2002 (online article) available from: https://www.gcca.eu [accessed on 29 April 2021].

National solid waste management strategy for Zambia by the environmental council of Zambia September 2004 (online article) available from: https://www.unep.org [accessed on 29 April 2021].

Management of garbage in markets ran by Lusaka city council by Enos Phiri April 2016 (online article) available from: https://www.researchgate.net [accessed on 292 April 2021]

Refuse management problems in Lusaka Zambia by P.B. Majura (online article) available from: https://www.wedc-knowledge.iboro.ac.uk [accessed on 29 April 2021].

Understanding Issues of Assistance in the Solid Waste Sector by JICA (online article) available from: https://www.jica.gov [accessed on 29 April 2021]

APPENDIX

Appendix 1: Information sheet

INFORMATION SHEET

TITLE

SOLID WASTE MANAGEMENT AND DISPOSAL PRACTICES IN THE CENTRAL BUSINESS DISTRICT OF LUSAKA DISTRICT

My name is **ROBERT CHIBESA** currently a 4 year student at the **University of Lusaka** pursuing my BSc in PUBLIC HEALTH sciences. This research is being conducted for academic purposes as it is a partial fulfillment for a student at the University of Lusaka for the conferment of a BSc certificate.

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or if you would like more information. Take time to decide whether or not to take part.

The participants that have been selected for the study will be required to respond or answer questions that will be provided to them through the use of a questionnaire or an interview that will be provided to the participants by the researcher.

The reason why the participants have been selected is simply because of the location of their place of business or work which is the central business district of Lusaka which is the main focus area for the research study and the selection method that has been used is the random selection technique which puts every individual conduction or operating in the CBD of Lusaka an equal opportunity of being part of this research study.

The participants of this study are highly assured of confidentiality as there is no need of indicating or contact details of participants or any information that would trace back to the participants. Information provided by the participants will be written down in the questionnaires

or interview guides that will be provided by the researcher and that these files will be filled by the researcher for references and only the researcher will have access to this information.

For further information please contact:

ROBERT CHIBESA: 0974868258 (Researcher)

OR

BROWN NGENDA: 0977126115 (Supervisor)

THANK YOU.

Appendix 2: Consent form

CONSENT FORM

Dear participant,

My name is ROBERT CHIBESA; I am a 4th year health science student at the University of Lusaka, school of medicine and health sciences. I am studying a course known as Public Health, in which am required to carry out a research project. I am therefore, doing a project on solid waste management and disposal practices in the central business district of Lusaka and your contributions will be highly valuable for this research.

You have been randomly selected and as a participant you will be required to answer questions, some which may be personal. Be assured that the information reviewed will be highly confidential.

You are at liberty to either accept or refuse to participate to answer this questionnaire or interview guide. Your choice will strictly be dependent on you.

If you choose to accept to participate, you will only be required to provide truthful answers to the questions. This will benefit me to accurately answer the questions of this research.

This research is for academic purposes as it is a partial requirement at the University of Lusaka for the conferment of a BSc in Public Health degree, therefore no incentives will be provided to the participants as it is for academic purposes.

Thank you.

Signature; ……

Date; …….

INTERVIEW GUIDE

SOLID WASTE MANAGEMENT AND DISPOSAL PRACTICES IN THE CENTRAL BUSINESS DISTRICT OF LUSAKA INTERVIEW GUIDE

Q1. HOW IS SOLID WASTE DISPOSED OFF

Q2. WHAT IS THE HIGHEST LEVEL OF EDUCATION ATTAINED

Q3. WHAT ARE THE ALTERNATIVE METHODS OF DISPOSAL THAT YOU HAVE EMPLOYED

Q4. HOW MANY TIMES IS SOLID WASTE COLLECTED IN A WEEK?

Q5. DO YOU HAVE KNOWLEDGE OF WHERE THE SOLID WASTE IS TAKEN AFTER COLLECTION

Q6. WHAT DISEASES MAY ARISE DUE TO POOR SOLID WASTE MANAGEMENT AND DISPOSAL

Q7. WHO COLLECTS THE SOLID WASTE

Q8. WHAT RECOMMENDATIONS WOULD YOU GIVE TO IMPROVE SOLID WASTE MANAGEMENT

Q9. DO YOU HAVE KNOWLEDGE OF WHAT IS DONE TO INDIVIDUALS THAT ARE FOUND WANTING OF IMPROPER DISPOSAL OF SOLID WASTE

Q10. HOW IS THE SOLID WASTE STORED BEFORE COLLECTION

NATIONAL HEALTH RESEARCH AUTHORITY
Paediatric Centre of Excellence, University Teaching Hospital, P.O. Box 30075, LUSAKA
Chalala Office Lot No. 18961/M, Off Kasama Road, P.O. Box 30075, LUSAKA
Tell: +260211 250309 | Email: znhrasec@nhra.org.zm | www.nhra.org.zm

Ref No: NHRA0000004/25/11/2021 **Date: 25th November, 2021**

The Principal Investigator,
Robert Chibesa,
University of Lusaka,
Lusaka, Zambia.

Dear Robert Chibesa,

Re: Request for Authority to Conduct Research

The National Health Research Authority is in receipt of your request for authority to conduct research titled **"SOLID WASTE DISPOSAL AND MANAGEMENT PRACTICES IN THE CENTRAL BUSINESS DISTRICT OF LUSAKA, ZAMBIA."**

I wish to inform you that following submission of your request to the Authority, our review of the same and in view of the ethical clearance, this study has been **APPROVED** on condition that:

1. The relevant Provincial and District Medical Officers where the study is being conducted are fully appraised;
2. Progress updates are provided to NHRA quarterly from the date of commencement of the study;
3. The final study report is cleared by the NHRA before any publication or dissemination within or outside the country;
4. After clearance for publication or dissemination by the NHRA, the final study report is shared with all relevant Provincial and District Directors of Health where the study was being conducted, University leadership, and all key respondents.

Yours sincerely,

Prof. Godfrey Biemba
Director/CEO
National Health Research Authority

Lusaka City Council
OFFICE OF THE TOWN CLERK

Civic Centre
Independence Avenue
P.O.Box 30077
10101 Lusaka - Zambia

Telephone: +260 211 252 997
Fax: +260 211 252 141
E-mail: lusakacitycouncil@mlgh.gov.zm
www.lcc.gov.zm

Our Reference: CM/rk
TCD/7/57/5A

TO WHOM IT MAY CONCERN
LUSAKA.

Dear Madam/Sir,

DATE: 15th November, 2021.

RESEARCH PROJECT -- ROBERT CHIBESA

The above named is an undergraduate student who is in the fourth year pursuing Bachelor of Science in Public Health in the School of Medicine at the University of Lusaka currently undertaking a research study on **"Solid waste management and disposal practices in central business district of Lusaka, Zambia."**

He has since paid the fee of K97.00 on receipt number 01320618.

Kindly therefore, assist him with the needed information for the successful completion of this research project.

Yours faithfully
LUSAKA CITY COUNCIL

Alex Mwansa
TOWN CLERK

UNIVERSITY OF LUSAKA

SCHOOL OF MEDICINE AND HEALTH SCIENCES
LEOPARDS HILL CAMPUS
Plot No. 37413, Off Alick Nkhata Mass Media. P. O Box 36711, Lusaka.
Phone: +260211258505, 258409 Fax +260211233409; Cell +260976075850,961917862,
E-mail: unilus@zamnet.zm, ictar@zamnet.zm

13th September, 2021

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: INTRODUCTORY LETTER FOR STUDENT'S RESEARCH

The University of Lusaka (UNILUS) wishes to introduce to you the undermentioned undergraduate student who is in the fourth year pursuing the Bachelor of Science in Public Health in the School of Medicine and Health Sciences. As per UNILUS requirement, the undermentioned student is carrying out and academic research entitled, "solid waste management and disposal practices in the central business district of Lusaka, Zambia."

This research is in partial fulfillment of the Bachelor of Science in Public Health degree, and has been approved by the University of Lusaka Ethics Committee.

Name of student: ROBERT CHIBESA
Identity number: BSPH18111196

Thank you in anticipation.

Yours sincerely,

Kevin C. Chungu
Head of Public Health Department

UNIVERSITY OF LUSAKA
SCHOOL OF MEDICINE AND HEALTH SCIENCES
LEOPARDS HILL CAMPUS
Plot No. 37413, Off Alick Nkhata Mass Media. P. O Box 36711, Lusaka.
Phone: +260211258505, 258409 Fax +260211233409; Cell +260976075850,961917862,
E-mail:unilus@zamnet.zm,ictar@zamnet.zm

SCHOOL OF MEDICINE AND HEALTH SCIENCES RESEARCH ETHICS COMMITTEE

Ref no: IORG0010092- 068/2/21

Date: 26th August, 2021

ROBERT CHIBESA BSPH18111196

Re: Research Title – SOLID WASTE DISPOSAL AND MANAGEMENT PRACTICES IN THE CENTRAL BUSINESS DISTRICT OF LUSAKA, ZAMBIA

The above research was submitted to the research ethics committee for review. The study has no major ethical problems and is approved subject to the following:

1. The study cannot be changed without express permission of the UNILUS Research ethics committee
2. Approval from the Lusaka District health Management or equivalent health authorities should be sought.
3. The study tools should be added.
4. An informed consent form should be attached and filled by all study participants (If dealing with primary data)
5. The risks and benefits should be included in the consent form.

Congratulations and the committee wishes you success in your work.

Prof Kasonde Bowa
MSc(Glasgow),M.Med(UNZA),FRCS(Glasgow),FACS,FCS,DPH(LSTMH),MPH(UCL)
Chairman- UNILUS REC
Professor of Urology and Consultant Urologist
Executive Dean
University of Lusaka and University Teaching Hospital
School of Medicine and Health Sciences.

UNIVERSITY OF LUSAKA
SCHOOL OF MEDICINE AND HEALTH SCIENCES
LEOPARDS HILL CAMPUS
Plot No. 37413, Off Alick Nkhata Mass Media. P. O Box 36711, Lusaka.
Phone: +260211258505, 258409 Fax +260211233409; Cell +260976075850,961917862,
E-mail:unilus@zamnet.zm,ictar@zamnet.zm

Date: 26th August, 2021

……

……..

……..

PERMISSION FOR **ROBERT CHIBESA STUDENT No BSPH18111196** TO CONDUCT A RESEARCH STUDY AT YOUR FACILITY/ INSTITUTION/ ORGANIZATION

Reference is made to the above subject matter

The University of Lusaka, School of Medicine and Health Sciences here by requests for permission for **Robert Chibesa** a Public Health Student to conduct research at your facility/ institution/ organization, entitled**; SOLID WASTE DISPOSAL AND MANAGEMENT PRACTICES IN THE CENTRAL BUSINESS DISTRICT OF LUSAKA, ZAMBIA.**

The research is in partial fulfillment of the requirements for the degree of Bachelor of Science Public Health. This is purely for academic purposes and information gained in such a way will not be used in the public domain without prior authorization from the institutions/ organizations involved.

The research topic has been cleared by the University of Lusaka, School of Medicine and Health Sciences Research Ethics Committee as per the attached copy. Data collection is expected to be done from **30th August, 2021 to 30th October, 2021**.

The University of Lusaka avails itself of this opportunity to review to your office the assurances of its highest considerations and looks forward to your timely and favorable response.

Prof Kasonde Bowa
MSc(Glasgow),M.Med(UNZA),FRCS(Glasgow),FACS,FCS,DPH(LSTMH),MPH(UCL)
Chairman- UNILUS REC
Professor of Urology and Consultant Urologist
Executive Dean University of Lusaka and University Teaching Hospital
School of Medicine and Health Sciences.