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Stakeholder Perceptions Of The Use Of Underground Bins As A Strategy To Address Municipal Solid Waste Challenges In Ruwa

BY

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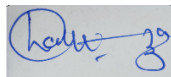
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APPROVAL FORM

The undersigned certify that they have read this project and have approved its submission for marking after confirming that it confines to the Faculty of Science, Geography Department, and HBSc DMS requirements.

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DECLARATION FORM

I, **DIMINGU TANYARADZWA SARAH**, registration number **B201915B**, declare that this dissertation is the product of my own work and has not been submitted before to any University other than Bindura University of Science Education. All the sources used or quoted have been indicated and recognized as complete references.

Signature   <u>**Tanyaradzwa Sarah Dimingu**</u>

Date   <u>**28 May 2024**</u>

DEDICATION

This dissertation is dedicated to my parents Mr Victor and Mrs Easter Dimingu. Thank you for your unconditional support and love. I also dedicate this work to my sister Audrey Dimingu,Aldrine Dimingu and Perseverance Dimingu. This would be impossible if it was not for your love, care, kindness and support. Mum and Dad I thank you for having faith and believing in me. You have been my strength throughout and I express my sincere gratitude from the deepest part of my heart.

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ABSTRACT

The study evaluated the perceptions of Stakeholders of the underground bins as a strategy to address municipal solid waste challenges in Ruwa Mavambo shopping Centre. The United Nations Conference on Environment and Sustainable Development's Agenda 21 action program in 1992 underscored the importance of environmentally responsible waste management practices for preserving the planet's environment and promoting sustainable development (Hodgson, 2023).Qualitative and quantitative analysis was engaged in data collection to gain a holistic approach. A questionnaire comprising open and close-ended questions was run to stakeholders and they were all accomplished for analysis. Interviews were also used to source information from the key informants. While 10% of the respondents were not aware of the underground bins in Ruwa Mavambo, 90% of the households were aware and they correctly recognized underground bins technology and its benefits.The study used a sample size of 132 respondents. It acknowledged the perception of the stakeholders around the Ruwa Mavambo shopping center towards the underground bins in managing solid waste. It revealed that most people which is 90% of the population view the underground bins as effective in managing solid waste. According to the respondent's information, it showed that the underground bins were effective but however they only catered to a few people hence there is a need for cooperation and collaboration to put the underground bins in most places in Zimbabwe as they are effective and efficient in dealing with the never-ending problem of waste management Research findings show the effects both positive and negative of underground technology. In assessing the underground effects, the study depicted that there is a need for community engagement, cooperation and collaboration, priority, and monitoring of the underground bins so that they remain working and sustainable.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

EMA –ENVIRONMENTAL MANAGEMENT AGENCY

ISO - INTERNATIONAL ORGANISATION FOR STANDARDIZATION

CBO- COMMUNITY BASED ORGANIZATION

INTRODUCTION

1.0 Introduction

This study examined the stakeholder perception of the use of underground bins in the Ruwa Mavambo area to manage the solid waste problem. The chapter focuses on the background of the study, the research problem, justification, the research objectives, questions, and delimination.

1.1 Background

Nilsson (2011) notes that Underground bins are recognized as an effective and convenient method for waste collection and recycling. They boast a substantial capacity for waste, necessitating minimal emptying and upkeep. As urban waste collection technologies evolve across various countries, traditional surface rubbish containers (above-ground neighborhood receptacles used for temporary storage of household waste) are being replaced with underground bins (metal boxes with steel chutes leading to large underground containers). This shift aims to enhance sanitation, prevent unpleasant odors, and stop waste scattering by animals. Despite the higher costs and technical complexity of underground systems compared to surface containers, they are installed to eliminate bad smells, improve urban cleanliness, reduce the presence of rodents and invertebrate animals, conserve space, and mitigate the negative visual impact of conventional neighborhood above-ground rubbish containers .European countries are practicing underground bins for example Tubc Environmental Solutions prides itself on partnering with the top manufacturers in Europe to ensure that underground waste technology options that bring international standards and International Organization for Standardization (ISO) 14001 are recognized. Gopi (2018) notes that underground bins will accommodate saving our animals from becoming extinct as a result of eating plastics and contaminated waste as it is starting to occur slowly as supported by the point that so many animals including elephants are dying at a higher rate in Victoria falls through consumption of plastic at on-ground landfills, according to Environment Africa a local environment charity organization .These animals are of benefit to our country as they are one

of the Big Five animals in Zimbabwe. Urbanization is increasing at a higher rate all over the world. Ali (2020) notes that the requirements of waste management differ because the underground bins automatically provide waste characterization by themselves hence waste characterization is done at the source. The collection of waste from door to door is now becoming difficult because of densely populated people in cities like Ruwa and the collection trucks face challenges in congestion fuel costs are expensive because of inflation in Zimbabwe it becomes cumbersome to manage waste collection. This causes waste not to be collected in suburbs which result in undesignated dumpsites. Waste can be collected at a central point where everyone knows. The underground bins have a higher capacity for loading waste. Glaydah (2023) the underground system has been successfully introduced and has already been introduced in some of the European countries. Chiatto (2023) states that in countries like Switzerland, and Zurich underground bins are used in public areas and some private companies are using them as dustbins. Davies (2020) defines waste as materials that are discarded or no longer useful, originating from various sources such as industry, agriculture, businesses, and households. These materials can take the form of liquid, solid, or gas and can be either hazardous or non-hazardous. Hodgson (2023) states that the United Nations Conference on Environment and Sustainable Development's Agenda 21 action program in 1992 underscored the importance of environmentally responsible waste management practices for preserving the planet's environment and promoting sustainable development .Underground bin perception is a complicated process since the system is still new in Zimbabwe. This insinuates a variety of mental perceptions such as knowledge, attitudes, and concerns about how it is of use or not and also if it is beneficial. The perception that a person has, is derived from how waste is being controlled in their surroundings. Stakeholders have different views because one cannot control the way a person thinks. The purpose of this study is to examine stakeholder perception of solving waste with underground bins to alleviate the challenge of waste management.

1.2. Problem statement

The ineffectiveness of solid waste management in Zimbabwe is contributing to negative impacts on the health of people and also the surroundings. The reason for choosing the Ruwa area is because that is where the underground bins have been installed recently in 2023 and the underground bins system is still a new thing that people are still getting used to and adopting. Considering this information, it will be best to measure the stakeholder perception of underground bins as a strategy to address municipal solid waste challenges in Ruwa Mavambo

shopping center to know if they should be installed or not in other areas of Zimbabwe In Zimbabwe waste is controlled through the installation of bins in the streets, skip bins, door-to-door collection of waste, and policies that give fines to people who throw litter in the undesignated are Environmental Management Act section 83 (1) of the EMA explicitly forbids littering at undesignated sites. Violators of this provision can face significant fines or imprisonment, and awareness about the treatment of waste but all of this seems to be in vain since the problem of waste is increasing day by day. People also burn their waste because it is not being collected which is causing air pollution.

1.3. Justification

If the environment is kept clean it will promote an aesthetic value of our surroundings and attain the sustainable goal of Vision 2030 of a clean and safe environment. A clean environment gives a disease-free environment. It is also a right for a human to live in a clean and safe environment. It creates a sense of legitimacy, it will be hard for just anyone to throw litter or drop litter in undesignated areas. The stakeholder perceptions are very critical in that they help in identifying areas of improvement, ensuring the relationship and partnership with the stakeholders, it helps in gaining awareness of whom you impact and depend on to fulfill the mission of addressing the issue of municipal solid waste. Gopi (2018) notes that underground bins will cater to save our animals from becoming extinct it is starting to occur slowly as supported by the point that so many animals mostly including elephants are dying at a higher rate in Victoria falls through consumption of plastic at on-ground landfills, according to Environment Africa, a local environment charity organization .These animals are of benefit to our country as they are our pride for the big five animals in Zimbabwe and increase tourism. Murgui and Hedblom (2017) notes that urbanization is increasing at a higher rate all over the world which is promoting uncontrolled waste .Even though underground systems are costly and technically more complex than surface containers they are effective in that surface underground bins prevent people who abuse waste by using globes and pumpers as drugs (drug abuse) from unmonitored dumpsites because underground bins can be locked and they are also monitored.

1.4 Main objective or aim

To assess stakeholder perception on the use of underground bins as a strategy to address the municipal solid waste challenge.

1.5 Specific Objectives

1) To assess the perceptions of stakeholders on the use of underground bins in Ruwa.
2) To identify the stakeholder views on underground bins in Ruwa's waste management.
3) To examine how stakeholders perceive underground bins as a solution to solid waste challenges in Ruwa.

1.6 Research questions

1) What are the perceptions of underground bins?
2) What are the negative and positive impacts of underground bins in the Ruwa Mavambo shopping center?
3) How effective are underground bins in the Ruwa Mavambo area Shopping Centre?

1.7 Limitations

Language barriers might slow down the process of doing interviews with people because of various ethnicities in Zimbabwe. Distance acts as a way of limiting this study because of the financial cost from Bindura to Harare which then leads to inadequate information. The resistance of people and attitude is another limitation because people may have had bad experiences in their past interviews.

1.8.Delimitation of the study

The study is only going to focus on solid waste management and perceptions of people on underground bins not any other waste like effluent waste and also the study is not going to focus on how politics is affecting waste management.

1.9 Definition of key terms

Underground bins Nilson (2011) described as an efficient and accessible way of collecting waste and recycling materials. They have a very large waste collection volume and require minimum emptying and maintenance.

Solid waste Davies (2020) defines waste as materials that are discarded or no longer useful, originating from various sources such as industry, agriculture, businesses, and households. These materials can take the form of liquid, solid, or gas and can be either hazardous or non-hazardous.

Stakeholder perception- is the way individuals or a group of people's perspective towards a certain project or program that is being conducted or that is already there.

1.10 Organization of the Study

The research study is organized into five chapters which enumerate and sequence the steps taken by the study. The chapters are as follows:

Chapter 1: Introduces the study in Ruwa Mavambo Shopping Center. The chapter covers the background of the study, statement of the problem, justification, objectives, research questions, and delimitation of the study.

Chapter 2: Reviews the ideas and previous research on underground bins managing solid waste and how effective they are globally, regionally, and locally.

Chapter 3: Presents the approaches used by the study in conducting the research.

Chapter 4: Presents the analysis, presentation, and discussion of the findings.

Chapter 5: The chapter presents the summary, conclusion, and recommendations established on the outcomes of the stakeholder perceptions.

1.11 Conclusion

The chapter stressed the background of the study, the aim of the study which is to assess the stakeholder perception of the underground bins in the Ruwa Mavambo Shopping area to address the problem of solid waste. It also gives the problem statement, objectives, justification, guiding research questions, and the delimitation of the study.

LITERATURE REVIEW

2.0 Introduction

This chapter depicts information related to underground bins as a strategy to address municipal solid waste challenges. This chapter outlined a literature review that aims to show an understanding of the existing information and establish reliability in the process. The studies presented will give an overall historical perspective on the topic of underground bins and how solid waste is being addressed in the Ruwa Mavambo Shopping Center area. Therefore, this review will look into underground bins and reveal how effective they are in solving the challenge of solid waste, the global view, regional and local level of underground bins on solving waste urbanization and population growth putting a strain on solid waste management, perception of stakeholders on the use of underground bins to reduce waste, merits, and demerits of using underground bins to reduce, the potential of underground bins to solid waste management and the gap in the literature review.

2.1 Global view of underground bins

According to Smith (2020) an underground garbage bin is a concept where the big-size bins are hidden in the ground and garbage is dumped there from a hinged opening from the top of the road levels. This design allows both community members and municipal workers to dispose of various types of solid waste. The substantial size of the bin accommodates approximately 1.5 tons of garbage. Once filled, the bin is lifted, emptied into a carrier truck, and transported to the main disposal site. The bin is securely closed, with the only access point being the hinged opening for waste disposal. Ideally, these bins are placed at road intersections and near residential areas for easy access. An electronic sensor is attached to each bin, triggering an alarm at a control center when the bin is full. This signal prompts workers to empty the bin, preparing it for the next cycle of use. Davies (2020) defines waste as materials that are discarded or no longer useful, originating from various sources such as industry, agriculture, businesses, and households. These materials can take the form of liquid, solid, or gas and can be either hazardous or non-hazardous.

The use of subsurface space is currently a crucial factor in achieving eco-friendly and sustainable development, particularly in urban areas where it improves solid waste management. As such, waste that is environmentally harmful or less economically viable to be placed on the surface can be moved underground. This frees up valuable surface space for other purposes and enhances the quality of urban living conditions. According to UN-HABITAT (2019) projections indicate that by 2050, the global population will reach approximately 9.5 billion, with around 6 billion people expected to live in urban centers, particularly in countries like the United States. This implies an increase in waste generation, underscoring the need for more efficient waste reduction methods.

Avci and Ozbulut (2018) highlight that underground bins offer superior protection compared to above-ground structures against disasters such as earthquakes, hurricanes, floods, tornados, external fires, blasts, radiation, and terrorist threats. Pileggi (2020) notes that the placement of hazardous industrial processes and waste treatment and disposal underground minimizes risks and disturbances like visual impact, noise pollution, odors, and diseases related to solid waste, as these bins serve as a barrier against these hazards. This leads to significant improvements in urban renewal .

On a global scale, Roosevelt Island in the USA has implemented the use of underground bins. These bins commissioned many years ago, handle 10 tons of waste daily from the island's 16 apartment complexes. This system eliminates the need for noisy and potentially hazardous collection trucks on the island's narrow, densely populated streets. The absence of unsightly, smelly piles of bags and dirty dumpsters contributes to a cleaner, healthier, and quieter environment for Roosevelt Island residents. Even after four decades, these underground bins remain effective and efficient. Notably, Roosevelt Island was the only New York City Sanitation District to maintain uninterrupted collections, marking this implementation a success.

Wembley City in Britain, a significant urban development project encompassing 85 acres of land around the Wembley Stadium, has been utilizing underground bins since 2008. This project includes 4,200 flats and various facilities such as retail shopping, hotels, and leisure amenities. The waste management system, which handles 160 tons of waste per week, consists of 252 inlet points for collecting four types of waste: rest, organic food waste, and mixed recyclables including paper and cardboard. The system has demonstrated remarkable efficiency to date, with rare instances of blockages due to oversized bags, thanks to its ability

to increase vacuum pressure and regulate issues. WIN (2011) notes that the project's environmental impact is significant and noticeable. It is estimated that this system can save about 400 tons of CO_2 emissions per year compared to traditional waste collection methods, by reducing waste collection vehicle movements by 75%, thereby contributing to climate change mitigation .Moreover, recycling rates among residents have significantly proved, with 40-45% of all waste being recycled, a considerable increase compared to the overall 21% recycling rate in Brent Council's area in 2006/07, which includes Wembley City.The underground bin system is also being adopted in Barcelona, Spain, France, and several other developed countries. WIN (2011) states that the primary environmental goals for waste management were to decrease the total amount of household waste, reduce heavy traffic from waste collection, and introduce source separation. Ali (2020) notes that the implementation of underground bins has helped achieve these objectives, indicating that these countries have accepted and benefited from the system.

2.2 Regional view of underground bins in addressing solid waste

Regionally countries like South Africa in Johannesburg and India are also practicing underground bins systems as a way to reduce waste according to All-Africa. So many countries are concentrating on underground bins rather than surface bins, for example, in 2018, the Surat Municipal Corporation (SMC) implemented a system of 43 sensor-equipped underground garbage bins in public spaces. These bins feature two sections: one for municipal workers to gather waste, and another for the public to dispose of their trash. To ensure efficient waste separation, the bins are divided into sections for dry and wet waste. Cointreau (2017) notes that each bin has a capacity of 3 cubic meters, with each section able to hold up to 1.5 tonnes of waste. Gopi (2018) notes that these advanced underground bins are designed to alert representatives when they reach 70% capacity, preventing overflow of garbage .This indicates that such systems have been well-received and found to be effective in various countries.

2.3 Local view of underground bins in Zimbabwe Harare

Locally in Zimbabwe's central business districts (CBDs) where commercial activities attract large groups of people who carry garbage with them an underground bins was installed. Tevera (2009) notes that waste container bins are very essential and they help keep the CBDs clean by holding the garbage that would have been thrown down and left to pollute the environment and human lives. All in all, underground bins are part of waste management and proper waste disposal that helps keep the environment clean. Mandevere (2016) notes that in recognizing the significance of bins in waste management, a company Probin partnered with the City of

Harare and the Environmental Management Agency (EMA) and installed underground bins along 4th Street in the CBD and also in the Ruwa Mavambo area there are underground bins which have been installed recently and it's a new thing or system to people which needs attention on the perspectives of other individuals. Ndum (2013) notes that, in many countries that started using this system long back, the systems have been effective and efficient. Till today they like the way the environment aesthetic is viewed without ordous (Johnson and Wilson, 2000).The environment aesthetic is viewed as clean immaculate and eco-friendly without odor. The underground bins has created many opportunities like employment and income.

2.4 Urbanisation and population growth putting a strain on solid waste management

Zimbabwe's population is anticipated to increase by 347,175 people and reach 16,099,216 by the beginning of 2024. The natural increase is expected to be positive, as the number of births will exceed the number of deaths by 393,959. If external migration remains at the previous year's level, the population will decline by 46,784 due to migration reasons. It means that the number of people who leave Zimbabwe to settle permanently in another country will succeed over the number of people who move into the country to settle there permanently. The population change rates in 2023 estimations, daily change rates of Zimbabwe population in 2023 will be the following, 1,557 live births average per day (64.86 an hour, 477 deaths average per day (19.89 an hour),128 emigrants average per day (-5.34 in an hour) (Zimbabwe,2023). The population of Zimbabwe is increasing by 951 persons daily in 2023. Zimbabwe's population density is 40.3 people per square kilometer (104.4/mi2) as of October 2023. The density of the population is calculated as the permanently settled population of Zimbabwe divided by the total area of the country. Total area is the sum of land and water areas within international boundaries and coastlines of Zimbabwe. The total area of Zimbabwe is 390,760 km^2 (150,873 square miles (United Nations Statistics Division, n.d.).

This kind of increase in population means that there is going to be an increase in waste putting a strain on waste management. To understand the dynamic interactions between cities and the environment and issues like climate change, resource consumption, and declining quality of life, the scientific community highlights the necessity for underground bins. Chioatto (2023) suggests that the 2030 Agenda of the United Nations Sustainable Development Goals, especially SDG 11, which focuses on creating inclusive, safe, resilient, and sustainable cities, significantly impacts population increase and urbanization. D'Adamo (2022) points out that regions with higher population densities tend to generate more waste, which in turn requires

more extensive waste management infrastructure. This underscores the need for underground bins, which not only save space but also conceal waste, contributing to a cleaner environment

2.5 The perception of stakeholders on the use of underground bins to reduce waste

Pedrini and Ferri (2019) defined stakeholders as individuals or groups with an entrusted interest in the outcome of a project. Supervising stakeholder perceptions in projects is essential to ensure that the project is successful. Stakeholders are the most party affected by the project hence is essential to know their perceptions. Debashis (2023) notes that Stakeholders know their places better than anyone else and they benefit from it and they provide the most honest opinion of the project and this helps in whether to continue or not with the project and coming up with better solutions. The perception of stakeholders can make or break a project, so it is vital to manage their expectations and keep them informed.

The perception of stakeholders helps in picking the gaps in the project and improvements may be made. A perception gap exists when there is a difference between the actual performance of the underground bins project and how stakeholders recognize it. Forms of viewing the perception of people through interviews and questionnaires. Nyanzou (2014) notes that Stakeholders like the Environmental Management Agency, the Community, and Underground bins owners are the stakeholders that have the potential to provide the perception of underground bins because they are managing and are involved with underground bins.

2.6 Merits and Demerits of Underground bins over surface bins

Compared to surface dumpers or bins in the same area, underground bins stations have a better holding capacity. They also increase the effective capacity of the bins by 1.5 to 2.5 times due to the compaction of the trash and this reduces the burning of waste. Burning of waste results when waste on the surface is not collected and people will be bothered by the view of the disorder of waste also they do not have a choice of keeping waste in their household .Orodho (2012) notes that this leads to respiratory diseases and also enhances carbon dioxide in the air through the burning of waste which promotes climate change resulting in hazards and disasters like fire outbreaks, heat waves heavy rains, and droughts.Paya (2016) notes that the country's developmental projects will be lagged down whilst dealing with disasters caused voluntarily by people.

Higher hygiene standards, preventing bacterial growth and odor issues, and enhanced aesthetics are enhanced by underground bins. This is because underground bins are burned underneath the earth and waste is managed under the grounds. Surface bins reduce problems of cholera

whereby infiltration (when it rains) on landfills affects the water table, and sources like boreholes and wells are contaminated which results in cholera and typhoid. Also, the flies are avoided by the underground bins because they are closed and do not produce smells. On surface ground bins they result in overflowing of waste and there will be a production of so numerous flies undergo a transformation where, in a span of three to six days, their pupae form legs and wings, eventually maturing into adult house flies. Females can reproduce within a period of two to three days..

Hodgson (2023) states that this causes cholera to spread to nearby houses and it will spread quickly for example the latest series of outbreaks was first recorded in five suburbs of Harare .In a statement, the Harare City Council reported that out of five identified cases, three were associated with individuals who had recently traveled to Buhera District, a known cholera hotspot in Manicaland Province. The city of Harare, home to nearly two million people, has been without running water for several days, raising concerns about the rapid spread of the disease. Charles (2023) notes that St Francis High School during September there was an outbreak of cholera .Also, the underground bins do not promote mosquito breeding, on surface bins breeding of mosquitoes is most common because mosquitoes dump moist areas hence becoming pests to people and animals.

Also, the underground bins do not encourage people to use drugs. On surface ground bins street kids or just random people take up lighting globes and pumper or glue so that they can use them as drugs which causes robberies or abuse of innocent people and harm to the people who take drugs. This is caused mainly because no one is monitoring the surface bins hence one can do what one wants to do without facing any challenges. The underground bins are monitored and are inaccessible to get the stuff that can be used for drugs.

The underground bins have minimal maintenance needs and excellent anti-vandalism protection unlike the surface skip bins and waste transfer stations people can easily vandalize them and turn them into other kinds of businesses other than just dropping waste (Mafume, 2016). Mostly the skip bins result in undesignated landfills for dropping waste. Underground bins have low maintenance in that the waste is thrown in each bin that is characterized by sections of general waste, plastics, metals, papers, and glasses where they are supposed to be hence keeping it clean. Also, waste is kept underground where it cannot overflow than landfills. There are lesser chances of fire outbreaks, unlike surface bins where fire outbreaks are common because people carelessly start a fire through smoking or wanting to reduce the waste because

it is not being collected and naturally as papers, plastics, card boxes, and chemicals are mixed on the same place without being characterized causing natural fires for examples the fire outbreak that occurred in Pomona which is now called Geo Pomona waste transfer for two weeks from the 3rd of October 2023.

2.7 Potential of underground bins for solid waste management

The underground bins have possible several advantages that can solve the waste management solutions in Zimbabwe. Having underground bins is more visually appealing. Ali (2020) states that they are efficient and they promote recycling and this can be done to a much greater extent which is an advantage to the economy of the country.The underground bins have environmental benefits which can reduce greenhouse gas emissions and traffic congestion by lowering the number of garbage trucks required. Rathore (2020) notes that these methods can lower the chance of waste collection-related incidents while also enhancing general cleanliness and hygiene in urban areas and improving sanitation at the same time.

2.8 Gap in the Literature Review

The gap in the literature review is that there is little information especially in Zimbabwe for local information and in Africa because there are few countries that are using underground bins. Countries are still adopting the systems of underground bins.

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the methodology that was used for data collection. The chapter depicts the approach that was used in gathering data from the stakeholders. The population target and the random sampling that was used are also discussed. The tools that were used were questionnaires and interviews. The study sought to determine the perceptions of stakeholders regarding the underground bins in solving the problem of solid waste in the Ruwa Mavambo area.

3.1 Description of the area

Ruwa is an area situated in Goromonzi Mashonaland East as well as under Harare Metropolitan province. Ruwa is located in the Mashonaland East Province of Zimbabwe. It's situated 22 km southeast of the capital, Harare, on the main Harare-Mutare highway and railway line. The climate for Ruwa ranges differently from January up to December. The monthly temperature ranges show a progressive variation, with October seeing the greatest temperatures of approximately 30.5°C (86.9°F) and July experiencing the lowest temperatures of 8.3°C (46.9°F). There are notable changes in the annual rainfall pattern, with 151mm (5.94") of heavy rain in January and only 1mm (0.04") of showers in August and September. From April to August, Ruwa experiences an average of 7.5 hours of sunshine per day, with a peak of 11.3 hours in November. The humidity throughout the year, there is a noticeable variation in relative humidity, which peaks in February at 81% and falls to 39% in September. There is also a mild wind in the town, with average speeds ranging from 7.7 km/h (4.8 mph) to 11.6 km/h (7.2 mph).1. The total population reaches 94 083 according to the 2022 census showing an increase from the census done in 2002 reaching 22038. The study area is situated at an elevation of 1562 meters. The study area is situated at latitude -17.88972 and longitude 31.24472. Site selection of the underground bins and landfall site was considered at a convenient area in Ruwa where a large number of households and supermarkets can access bins. Ruwa contains riverine, sandy miombo woodlands, and maize plots just to state a few. Ruwa municipality contains one hospital, 9 councillors, and 15 schools. The temperatures range between 16.6 degrees and 25.8

degrees in January and fluctuate between 17.4 and 27 degrees. The rainfall ranges from 151 mm in January up to 538 mm in December. Below is an illustration of the study area map (fig 3.1.

Fig 3.1 The study area map
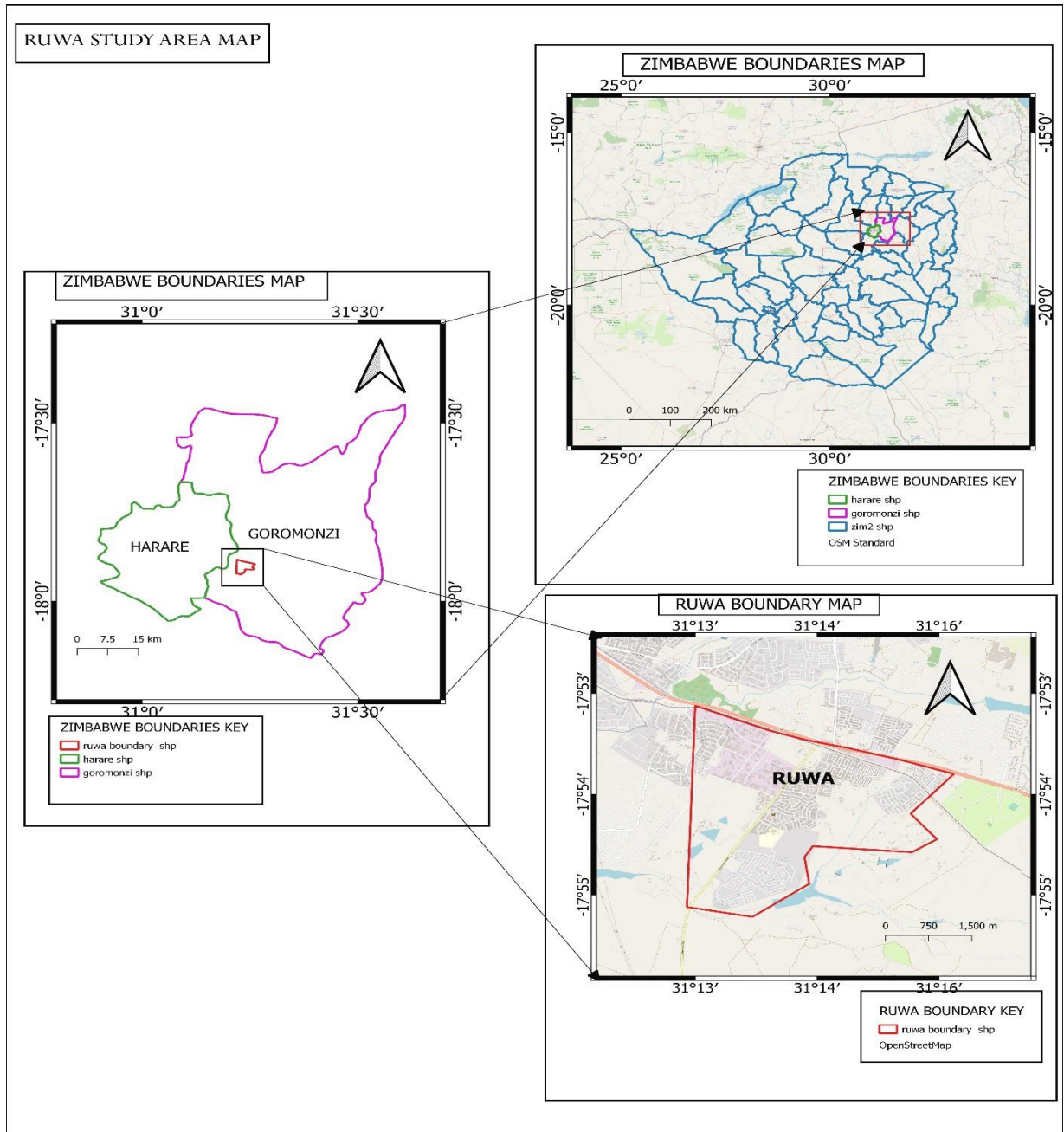
3.2 Research design

The study chose qualitative and quantitative research design which is a mixed approach that provides authentic and reliable data. The quantitative data was used to complement the quantitative data. The data collected includes the perception of the stakeholders on underground bins in solving the solid waste problem, how the underground bins have affected the lives of people, and the significant changes brought about. The qualitative data addresses the how and why research questions, and enables a deeper understanding of experiences, phenomena, and context. It is the best instrument to use mostly since it deals with the human mind and it helps in giving responses and replies to the questions to fulfill the purpose of the study and to also see their perspective about the underground bins. The data was collected using qualitative means that included questionnaires, and key interviews. These methods permitted the study to gather rich exhaustive data about stakeholders' perceptions and experiences. The study was able to note and investigate the non-observable human qualities and behaviours that include ideas, feelings, attitudes, and views through qualitative data collection.

Interviews and questionnaires were conducted to obtain a diverse and comprehensive range of data from research participants to come up with reliable answers and most people's perceptions and views of underground bins. This data was analyzed to collect and create a holistic understanding of stakeholders' perceptions regarding underground bins in the Ruwa Mavambo area. Research design is the comprehensive strategy that seeks to provide an appropriate framework for the study and it determines how relevant information is for the study. Jaradat, (2018).This outlines the comprehensive procedures employed by the study, the data that will be gathered, the techniques for data collection, and the methods of data analysis used to understand the perspectives and opinions of stakeholders .

15

3.3 Research methodology

The study used both the mixed method approach of qualitative and quantitative study methods. The qualitative data was collected through the Key informants' interviews and questionnaires which comprised both open-ended and closed-ended questions. The quantitative method complements the qualitative approach. The qualitative approach and data provide first-hand information, and deep understanding and cover data that quantitative data cannot provide. Quantitative data is used to generate hypotheses for information being searched about. Qualitative has closed and open-ended questions and it is a source for sightseeing and considering the significance of individuals or groups' perceptions of a social problem (Creswell, 2016).

3.4 Target population

The targeted population for this study is stakeholders. Ruwa Mavambo areas have many stakeholders that can be affected by solid waste and the underground bins both negatively and positively. These stakeholders include the Residents, the underground bin owners, and the Environmental Management Agency. According to Lut et al (2008), population refers to people who appeal to the interest of the study in generalizing the outcomes of the research. The target population therefore refers to a group of individuals that the study intends to conduct a study on and draw conclusions and results from.

3.5 Sampling techniques

A population sample of 132 out of 200 people was used to meet the purpose of the study and to see the stakeholder's perceptions. A sample is a subset from a larger population for reliable data. The Raosoft formula was used to determine the sample size and an estimated sample was 132. The confidence level and margin error were 95 percent and 5 percent respectively. Random sampling technique was to be used to select residents and stakeholders that are going to be included and this technique is being used because of the larger population.

3.6 Research methods

PEDIAA (2015) notes that research methods are ways employed by the study to give answers to the questions from the study and also give clarification and explanation of different concepts used in the study both qualitative and quantitative .Key informants Interviews and

questionnaires were used for data collection this was done for transparency and to have reliable data as the study picks the answers given by several views of stakeholders.

3.6.1 Interviews

There was the use of structured interview questions. The questions were standardized and were asked to all stakeholders. This type of interview allowed the information about the perspectives of the stakeholders to be collected with consistency and to be comparable. The questions were open-minded. The key informant interview helped to note how people perceive the underground bins in solving the problem of solid waste.An interview is a conversation of gathering information and it can be done in person or by use of mobile phones. McNamara (1999) notes that interviews can evoke different feelings, thoughts, and experiences through the in-depth information given from people's views .Interviews come in different ways which consist of structured questions, semi-structured questions, and also unstructured questions.

During the interview, the key informants were asked a series of questions constructed on the interview guide in Appendix 1 (see Appendix 1).

3.6.2 Questionnaire

The questionnaire guide with both open and closed ended questions was distributed to the stakeholders. The targeted population was the respondent read the questions understood the questions to what was expected, and wrote down the answers. In a questionnaire, all stakeholders read the questions, interpret what is expected, and write down the answers. The questionnaire aimed to seek the stakeholders' information about how the underground bins affect their livelihoods and how they address the issue of solid waste management. Goode (2018) states that a questionnaire is a series of questions asked by individuals to obtain statistically useful information which is also descriptive and explained about a given topic.

The study noted that the questionnaire is affected by language barrier literacy and biased information from the community as the stakeholder. The questionnaire acted as a primary source of data and the study was able to explore and understand the feelings and behavior of people whilst communicating with them also fast and cost-effective. Leedy (2013) notes that the questionnaire helped the study get information about cleanliness, convenience, safety, and how effective they are in reducing the problems caused by the mismanagement of solid waste .

A questionnaire guide was used to collect data from the respondents in Appendix 2 (refer to Appendix 2).

3.7 Data analysis methods

The quantitative data was organized in a format suitable for statistical analysis using Microsoft Excel. This data was subsequently visualized using bar graphs, tables, and pie charts. The research methodologies employed in this study included the use of questionnaires and interviews.The questions were numbered to eradicate repetition and other errors before the entry of the data. There was the use of descriptive statistics and some figures for graphical presentation. Percentages were used to characterize the perceptions of stakeholders.

3.8 Reliability and validity

Reliability and validity are how well the methods measure the perceptions of the stakeholders. It is the consistency of a measure and the precision of the measure whether the results show or review what is supposed to be measured. Therefore the study used the multi-use method to conclude the validity of the instrument. Multi-use of questionnaires and key informants was used to determine the perceptions of stakeholders on underground bins. The Multi-use methods increased the validity of data through various sources of data.

3.9 Ethical considerations

The study observed the ethical standards and principles of the community stakeholders. These ethics included voluntary involvement, informed agreement, privacy, confidentiality, and no potential for harm. Flaming (2018) defined ethical considerations as integral to academic writing and ensuring reliability, credibility, and conduct with respect for all involved parties. The study clarified to the stakeholders the purpose of interfering with their personal lives and they agreed. This was done so that they feel comfortable and answer without fearing anything regarding the topic of their perception towards underground bins in solving solid waste problems. These considerations helped in gaining the trust of the stakeholders. The study assured the stakeholders that the research was for academic purposes.

3.10 Chapter Summary

This chapter examined the research design, research tools, and sampling methods employed for data collection. The research was structured to incorporate both qualitative and quantitative approaches, with a primary focus on qualitative research. Quantitative data was organized in a

manner that facilitated statistical analysis using Microsoft Excel. The data was subsequently presented through bar graphs, tables, and pie charts. The research instruments discussed encompassed questionnaires and interviews with key informants.

DATA PRESENTATION, ANALYSIS, AND DISCUSSION

4.1 Introduction

This chapter covers the primary outcomes of this study. The analysis of data in this chapter employs a blend of quantitative and qualitative methods. The subsections of this chapter encompass the depiction of the stakeholder perception of underground bins in solving solid waste in the Ruwa Mavambo area.

4.2 The demographic study respondents

This chapter looks at the demographic individualities of the stakeholders relating to solid waste and underground bins perception. The characteristics comprise age and level of education of respondents. The respondents were the Community, EMA officer, and Underground bin owners.

4.2.1 Respondants age group

The diagram below (4.1) shows the number of respondents in the Ruwa Mavambo area. The respondency age helped the study in knowing the perception of people because different age group have distinct experiences, perspectives and priorities.
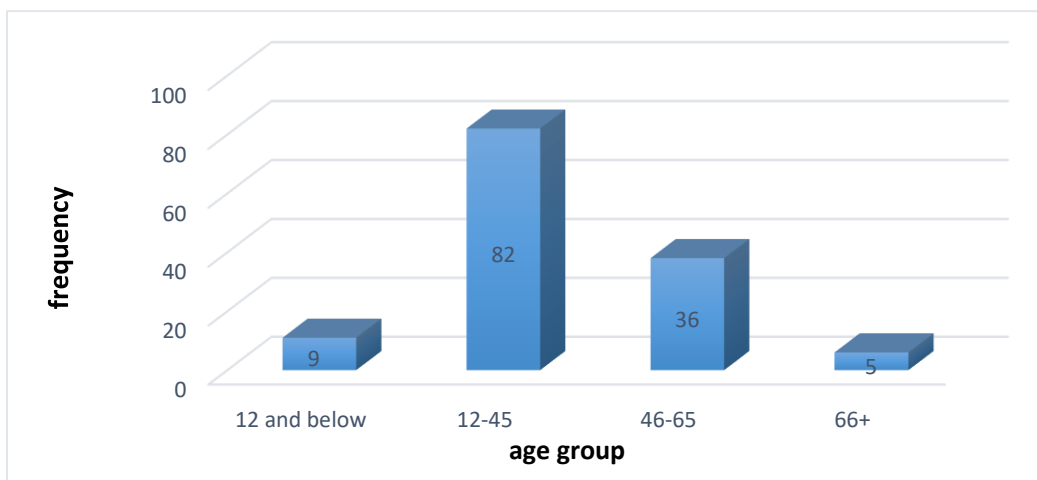
N=132

Figure 4.1 age of the respondents

Figure 4.1 indicates that the majority which is (60%) of respondents are in the 12 to 45 years age group this is because the group with the majority of respondents typically represents the most engaged individuals in the community and serves as the primary workforce in the area under study. Those aged between 46 and 65 consisted of 28% of the respondents respectively. The elderly 66 years and above consisted of 4% of the respondents and were included in the research to understand their view as they have more knowledge and trends of how solid waste was being managed all along the past year till today. They were supported by Tazeze et al (2012) who stated that strategies increase with knowledge and skill gained with age.

4.3 Respondents' level of education

Figure 4.2 shows the different levels of education attained by the stakeholders. Most levels of education attained is the primary level and this is mostly because that is where there are younger people who are still in the primary level. The secondary level is at medium and a few people attained tertiary. Different levels of education helped the study to get holistic information in understanding the issue of underground bins managing solid waste.

Figure 4.2 showing the level of stakeholders education level
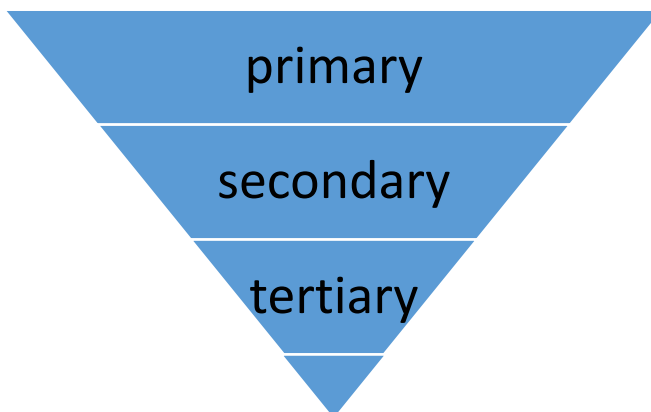
Figure 4.2 showing the level of stakeholders education level

From the research, the majority of the stakeholder attained primary and secondary education constituting 54% and 29% respectively, tertiary level (20%). The results meant that the population with level of education influences their perception of underground bins towards solid waste. Biesta (2007) states that Individuals with higher level of education had a comprehensive understanding of waste management practices and environmental issues and this led to more informed opinions.Due to diverse perspectives that merged across different education levels, they brought new insights and experiences. The primary educated respondents had a basic understanding of waste management concepts and practices however their level of

education was influenced by personal experiences and local practices. The secondary educated respondents had a broader knowledge base and understanding of environmental issues. Most of them were exposed to environmental programs that cover waste management and sustainability. The tertiary-level respondents show that they have received higher educations and have in-depth knowledge of waste practices, environmental science, and related disciplines. Their perceptions are influenced by academic studies, research, and a deeper understanding of the complexities of solid waste management. They have a critical and analytical approach, considering factors such as long-term sustainability, technological advancement, and policy implications (Granger, 2008). Despite the level of education, the individual perspectives varied widely within each group considering factors like culture, experiences, and values towards underground bins as a solution for solid waste.

4.4 Underground bins knowledge

To examine how stakeholders perceive underground bins as a solution to solid waste challenges in Ruwa out of 132 people the study reached the estimations shown in Table 4.3 below which indicate the number of people who were aware and the number of people who were not aware of the underground bins in Ruwa Mavambo.

Table 4.3 indicates the number of people who were aware and not aware of underground bins

	Aware	Not aware
Frequency	119	13
Percentage	90	10

Table 4.3 indicates the number of people who were aware and the number of people who were not aware of the underground bins in Ruwa Mavambo. **(N=132)** source of primary data

The majority of the respondents acknowledged that they knew about underground bins in Ruwa Mavambo area. The response indicated that 90% of the respondents had full knowledge of the existence of underground bins in Ruwa. During the interviews, the community stakeholders explained how underground bins have affected their lives and there was more emphasis on how good the underground bins are. However, some respondents (10%) showed ignorance of the underground bins because of limited exposure due to factors of being at work and also people left at home showing indifference about the information that they will be given.

A lower level of education can impact awareness and lead to ineffective environmental management. However, this lack of knowledge can be problematic as it impedes the progress and sustainability of their livelihoods. According to the questionnaire guide, respondents who were aware of underground bins described underground bins as a collection point for solid waste and also a drop-off center of solid waste where they could also earn money from individuals purchasing waste for recycling.

4.5 The perspectives of stakeholders on an underground bin in Ruwa Mavambo area.

The interview done with the Environmental Management Agency, the Locals and the owners of the underground bins (CBO) have all stated that the underground bins that were done at the Mavambo Shopping area were a very good project because the project has surpassed the mandate of the city council to collect waste from the residents. The locals stated that the underground bins improved the waste collection efficiency and reduced waste in the street as one brings his or her waste to the Mavambo area. The underground bins owners found the project of the underground bins as beneficial to the community as the skip bins or most surface bins lead to undesignated landfills. . Different forms of waste are being disposed on undesignated sites. This is causing diseases that include series cholera, typhoid malaria, and also causes water contamination. Open dumpsites are known for their bad odor and unattractive sights. Poor methods of disposing of waste result in haphazard disposal of waste which affects planning and may cause a bad smell disturb the aesthetic view of the environment and increase the rate of diseases as children mostly play with dirt and animals like dogs drags waste everywhere and also waste causes clogging of the sewer pipes and waterways. Also, the stakeholders have perceived the underground bins as a sustainable waste management solution that promotes proper waste disposal and encourages recycling. However, the underground owners have stated that there are issues that arise such as pests and this requires regular cleaning and pest management practices.

4.6 The positive impacts of underground bins.

The Environmental Management Agency officers first indicated how the underground bins has supported and improved its aim and goal to promote sustainable management of natural resources and protection of the environment with stakeholder participation. This has proved to be of great importance to them as they are trying to reduce solid waste due to infinite undesignated landfills resulting from waste not being collected. Dropping waste just anywhere has become the culture of people. Having the underground bins has solved the problem of waste not being collected it just requires individuals time to dump their waste. The responses highlighted that the underground bins minimized the risk of pollution to the water bodies and promoted waste segregation contributing to overall waste reduction.

The Community as stakeholders provides waste and were taught waste segregation, this benefited them in that they get paid for raw materials for recycling so there is no worry of overflowing the dumpsite as the waste is quickly bought, and either way it would be collected by the recyclers as indicated by the residents. This has improved the livelihood of people as highlighted from the questionnaire and interview that was conducted. This has improved the lives of young people, especially in that they are now find a source of living rather than staying in their bases and taking drugs, this has reduced the crime rates of robbery and also the contraction of disease in girls mostly because of seeking for money, now they have something safe to hold on to.

The Community also provided information that the underground bins have proven to be safe and not cause disease, unlike the surface bins. The underground bins have increased the aesthetic view of the Mavambo shopping area and they feel confident when buying their food around the area because the binning system is smart. This has hindered the children from playing with waste from dumps which would make them vulnerable to cholera also animals do not carry waste because they cannot access it.

The Community-based organization managing the site emerged that their social networks had improved from private sectors and also well-wishers in improving their lives this has emancipated them this has helped improve the country economically. They have improved human, financial, and social capital in their lives. The underground bins lead to the creation of employment through the community-based organization that is responsible for underground waste collection and maintenance.

4.7 The negative effects of underground bins

The study managed to note the negatives that the stakeholders faced and their perceptions on underground bins.
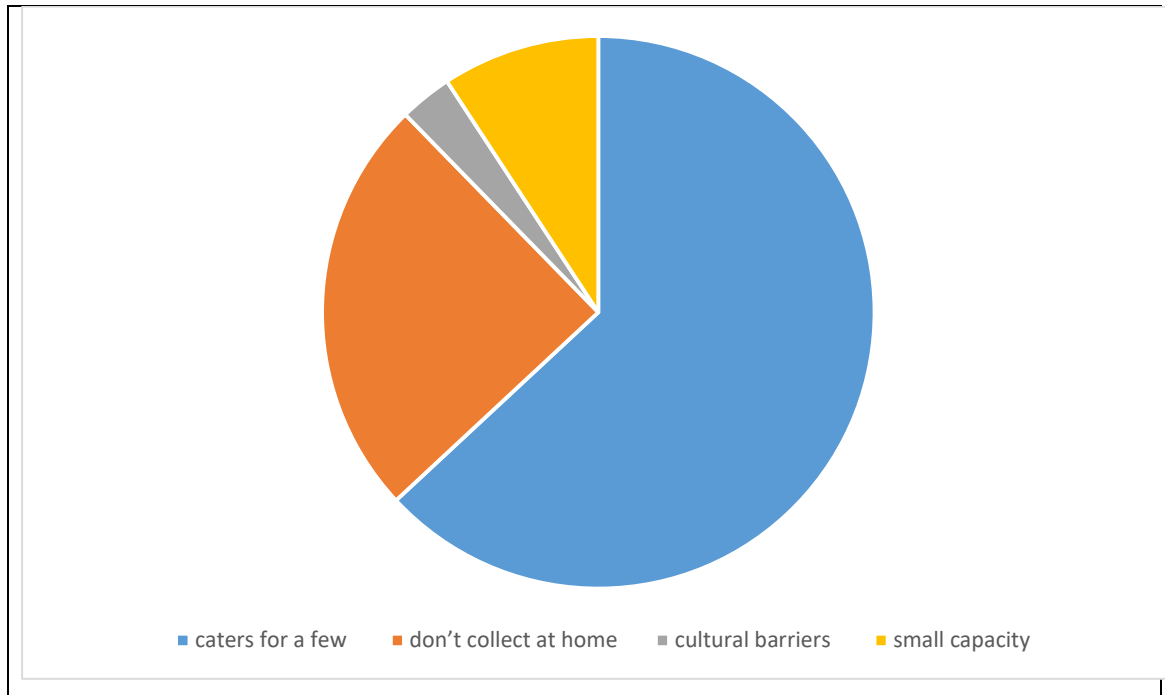
fig 4.4 showing the percentage of the negatives of the underground bins that has been installed in Ruwa

Caters for a few	Don't collect at home	Cultural	Small capacity
80%	50percent	10 %	40%

Figure 4.5 shows pictures and the whole view of underground bins and their compartments and their sizes.

FIG 4.5 shows the underground bins a the Mavambo Shoppiing area in Ruwa

4.7.1 The level of Underground bins serving few, causing discontent

 The interview and questionnaire responses depicted that the residence and Environmental Management Agency were mostly concerned with the fact that the underground bins only covered 200 people out of the whole community. One of the underground bins owners and the Environmental management officer said that

 '*the underground bins was only done to accommodate 200 people and this was for testing its effectiveness in solving solid waste management''*.

This means that the rest (80%) of the community (Ruwa) is still practicing the old ways of just dropping waste where they deem. Burning of waste is still being practiced which leads to air pollution, greenhouse gas emissions, and also a health risk to the residents. The responses reviewed that the underground bins may not be so effective if it only cater to a few people hence the potential of leading to revolts to the other residents whom are not receiving the same good treatment, the project might be tempered with those that are not receiving the treatment

because the project if not fully a community project. For a project to be successful it needs the community trustworthy, rapport building to all, cooperation and willingness so that the project flourish and most for project acceptance. The responses shows that there are still many undesignated landfills and they exacerbate the chances of contracting diseases like cholera and typhoid also malaria .This is due the fast breeding of flies and mosquitoes in most dump areas like dumps.

The questionnaire and interview responses from EMA and the Community show that the limited number of people who can access the underground bins led to a bit of conflict amongst the residents. Also, EMA stated that there will be limited environmental impact because underground bins are part of waste management strategies aimed at improving overall environmental sustainability. This hinders the aim of keeping the environment clean as it is done at a lower rate.

4.7.2 Perception of waste not being collected at households.
Based on the interview and questionnaires (50%) reveal that a person is supposed to bring their waste to the underground site. The residents complained that this is causing inconvenience to them as most of them do not spend their days at home but at work. A few of the community members aid that

 'the community-based organization should pick the waste at the households as most of them will be working and due to being tired from work and also the other chores to be done at home and also the time of the night not being safe to walk they mostly fai to dispose their waste at the site'.

This means that they cannot carry their waste at night and they will be too tired to dispose of their waste. They noted that the people they leave at home are too old, young, or disabled to carry waste at the site and sometimes it is due to the distances as the elderly are not so healthy to participate in the exercise for waste segregation and also carrying and walking the distance to the underground site. The children will be at school so time to dispose of their waste is limited. These negatives cause the lagging down of the project. This lags down the project and leads to health and sanitation issues.

4.7.3 Cultural barriers hindering the flourishing of the underground bins project in Ruwa Mavambo Shopping centre

The questionnaire shows that 10 % of people who are affected by the slow adoption of the technological advancement of underground bins still wants to continue practicing the old ways of surface bin waste disposal. Their perception and acceptance are very skeptical about underground bins. People are more hesitant to adopt underground bins because they are deeply rooted in traditional waste disposal methods. Their behavioural pattern may remain in their blood seeing all the technological advances as some type of bribe to do something for example political issues and they do not want to be involved so they remain tenacious about the surface bins. Most of the tenacious people are the elderly. The religion and cultures of some residents refuse them to expose their material or food through the technological way which then hinders the effectiveness of the project. The cultural conservatism is hindering the acceptance of the new technological system. Ndum (2013) states that the underground bins are perceived as time-consuming and inconvenient .Due to social judgment, it is hindering the acceptance of underground bins as from interviews and questions answered.

4.7.4 Smallholding capacity as a negative of the underground bins in Ruwa.

There is only one small underground bin in Ruwa which means that it gets full within a short space of time as highlighted by the underground bin owners. The workers noted that it is straining to clean the underground bins and the cost of trucks to collect waste. The owners also reviewed that the small capacity is affecting the underground bins in that it does not provide enough space for bulk items. This then leads to illegal dumping and improper waste disposal practices. The questionnaire shows that the small capacity underground bins if not emptied lead to the risk of overflowing. There is a need for supplemental waste management infrastructure to accommodate excess waste.

The underground owners stated that the small capacities of underground bins affect recycling in that it will be limited due to the small capacity of the underground bins. The benefits from waste being bought by the recycler make an insignificant amount of money which then demotivates the community from disposing of waste at the Mavambo underground bins area.

4.8 The effectiveness of underground bins in Ruwa Mavambo area

The questionnaires from the Environmental Management Agency, the Community, and the Underground bins owners show that the underground bins is effective to a greater extent. Environmental Management Agency found the underground bins effective because of how they

could assess the up-to-date information and the usage of bins and it shows that a great percentage of people love the system. There is a great improvement in Ruwa around the Mavambo shopping area in terms of waste. One officer stated that

'*generally the underground bins is very effective because the Minister of Environment, Climate, and Tourism also adopted an underground bins where he resides*'.

EMA officer distinguished that this binning system must be implemented everywhere in Zimbabwe promoting the recycling initiatives. However, they noted that the underground bins had to be implemented everywhere since it was only in Ruwa Mavambo area only serving a few people.

Moreover, the community responses to the underground bins saw the effectiveness of the underground bins to a greater extent because they can bring their waste whenever they deem to and anytime they want. They stated that they no longer worry about waste being not collected by the council or paying the private bin collector companies. The community is also being motivated by the recyclers who are buying waste from them which means that they are benefiting by getting money. They prove that the system is also smart and reliable and it has sections that guide one to sort their waste hence waste characterization. The questionnaire shows that the underground bins are effective in that they would like to continue having them as they reduce the disease caused by waste because the children would play with waste and the waste being carried by animals which include dogs and also pests like flies and they proved that underground bins improves hygiene. They greatly saw the effectiveness of the underground bins, other individuals wanted to engage themselves in recycling to enhance their livelihood. However, the community stated that the underground bins in Ruwa should be increased so that they cater to every individual and reduce the rate of illegal dumps, and also to have sustainable environment management strategies.

Furthermore, the owners of the underground bins showed that the underground bins are effective in that they enhance the waste management system. Since the Community-based organization is getting income they ensure that the project is effective since they are paid and they have a sense of ownership of the project they are doing their best to keep educating the people and encouraging them to keep on coming with their waste. They noted that the underground bins are very effective because people are interested in bringing their waste to the center. Also, they encourage waste segregation which promotes recycling. The system is

effective because they run it for their community by themselves and put their all into their project to be successful.

4.9 How are the underground bins affecting the environment in Ruwa.

The stakeholders from EMA, the Community, and the owners indicated that the underground bins is affecting the environment positively in that the bin contains waste and hinders the waste from escaping caused by wind or rain. They stated that this is reducing the rate of disease contamination one of the women stated that

'*since they installed the underground bins her children who bring waste at home were always admitted at the hospital because of cholera and injuries from solid waste but it has lessened now'*,

And also keeping the drainage system from clogging being caused by waste carried by rainfall hence keeping the area clean. Also, they seconded the underground bins control ordo unlike the surface bin and the illegal dumps hence improving the air quality in the local environment. The stakeholders all emerged on the information of underground bins reducing pests like flies, mosquitoes, and rats this reduced the diseases from spreading. The segregation of waste has limited the amount of waste sent to landfills and promoted resource conservation and a sustainable environment.

4.10 Summary

The study identified the perception of stakeholders on the underground bins in Ruwa Mavambo regarding the issue of solving solid waste management. The chapter presented, analyzed, and discussed research findings. It also discovered that the underground bins are essential and effective, however, they are at a small scale for proper waste management to be attained in the whole community not only for people around the Mavambo area.

SUMMARY AND DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.0 Introduction

This chapter provides a summary and discussion of the study's research findings, conclusion, and recommendations related to the research stakeholder perceptions of the use of underground bins as a strategy to address municipal solid waste challenges in Ruwa. The research's summary, recommendations, and conclusions drawn from the main findings are all presented in the study. The study aims to address and resolve questions posed by the project's objectives. It also formulates conclusions based on the data analysis to respond to the issue under consideration. Recommendations have been proposed in line with the primary findings.

5.1 Summary

The research findings indicated that underground bins can be delivered to a greater extent in Zimbabwe. The stakeholders proved that underground bins are beneficial to the communities as they are sustainable, smart, lessen the rate of diseases, people bring their waste whenever they want to, the underground bins discourage undesignated landfills. The stakeholders are favouring the underground bins as they are covering the gap caused by the council of not collecting waste which is the main problem of solid waste. The research also indicated that the underground bins came with employment as recyclers increased and the community-based organization managing the project also got employed which then made the project flourish. The stakeholders viewed the underground bins as efficient as the waste is stored underground and cannot be seen also they increased the aesthetic view and waste cannot be taken by dogs and children cannot play with it.

Similar studies have also observed the same benefits that the underground bins offer for example the installation of hazardous processes in industries, hazardous waste treatment, and disposal, below ground level, ensures minimum risk and disturbances such as optical impact, noise pollution, odours, and also diseases associated with solid waste because the underground bins act as a barrier to all these hazards. Therefore Pileggi (2020) notes that the improvements lead to the renewal of cities and especially urban environments.In Barcelona, Spain, France,

and many other developed countries the system is also being used. Ali et al, (2020) states that this shows that in these countries, the system was accepted and adopted as this benefited them. The challenge that is there is that there is one underground bin in the Ruwa Mavambo Shopping area and they only provide services for very few people.

5.2 Conclusion

It can be concluded that the introduction of underground bins in the Ruwa Mavambo area is successful. The underground bins are essential in the management of solid waste because solid waste is a problem that is difficult to end. The successful delivery of underground bins hinges on the management of solid waste to a greater extent. The underground bins were noted to have incredible power that overrides the surface bins and it makes the management of waste easier. From the research, the underground bins have been shown and proved to be sustainable as people bring their waste and it is collected by the recyclers who do it for business. The underground bins have increased the aesthetic view in the Ruwa Mavambo area and the underground bins successfully reduced the ordour and pest and they have also reduced vandalism and unauthorized access to the landfills.

5.3. RECOMMENDATIONS

The recommendations below are drawn from the study and they address the gap that should be covered to improve underground bins nationwide and also to improve the perceptions of people.

- The underground bins should be accessible to every individual in Zimbabwe to manage the problem of solid waste.
- There must be education and awareness from the environment department which includes EMA and also the city council and also this information should be disseminated through broadcasting news to everyone so that they know the benefits of having underground bins.
- The city council should make use of underground bins which are easier for people to use. The government and the city council should take into consideration and prioritize the underground as they reduce the undesignated landfills.

- To encourage all the stakeholders including the government to reward the communities that will cooperate and maintain the underground bins in their communities to reduce the solid waste problem.

- There is a need for stakeholder cooperation with sectors such as local authorities, waste management groups, community groups, and environmental organizations to ensure a coordinated and sustainable approach that includes them in the planning, implementation, and monitoring phase.

- There should be regular monitoring to manage waste and also to avoid them from resulting in landfills like how the skip bins are.

- There should be thorough community engagement and sufficient capacity and collection frequency by the municipal council and also the underground bins CBOs and EMA, this enhances the sense of ownership and responsibility among the community and as for ensuring the capacity of underground bins to be sufficient to accommodate the waste generated.

- There should be collaboration with the recycling facilities to a larger extent to ensure proper treatment and processing of recyclable materials collected from underground bins.

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Interview guide

Interview guide for all key informants

Project title: Stakeholder Perception of Underground Bins as a Strategy to Address Municipal Solid Waste Challenges in Ruwa Mavambo Shopping Centre.

My name is Tanyaradzwa .S. Dimingu, and I'm currently in my fourth year at Bindura University of Science Education, pursuing a Bachelor of Science Honours Degree in Disaster Management. As part of our final year requirements, we are expected to conduct a research project. My research focuses on "THE STAKEHOLDER PERCEPTION ON UNDERGROUND BINS IN RUWA MAVAMBO SHOPPING CENTER ". This interview guide has been designed to collect information from representatives associated with underground bins on solid waste management. You are requested to provide the following information to the best of your knowledge. The information will be treated with strict confidentiality.

Interview date 16/03/24

1. Are the underground bins better than surface bins?

2. Do most families dispose of waste at the underground bins at Ruwa Mavambo Shopping area?

3. How is the underground bins affecting the environment?

4. To what extent do you think underground bins can be sustainable?

5. In your own opinion is there anything you think that can be done to improve the underground bins?

6. What are the significant changes that you have noted that are being brought by the underground bins?

7. Is there any awareness being done to educate the community about the underground bins in Ruwa Mavambo Shopping Centre?

8. What are the challenges being faced in managing the underground bins concerning managing solid waste?

9.   Do you think there is enough support being done to improve the management of solid waste through underground bins in Ruwa Mavambo Shopping Centre?

10.   How do you think people are taking the technological advancement of underground bins in Ruwa?

11.   As the environmental management officers and the CBO what are your perceptions of the underground bins in managing solid waste?

Questionnaire guide

Questionnaire guide

My name is Tanyaradzwa .S. Dimingu, and I'm currently in my fourth year at Bindura University of Science Education, pursuing a Bachelor of Science Honours Degree in Disaster Management. As part of our final year requirements, we are expected to conduct a research project. My research focuses on "THE STAKEHOLDER PERCEPTION ON UNDERGROUND BINS IN RUWA MAVAMBO SHOPPING CENTER ". I am reaching out to request your help, input, and any pertinent information related to my study. The goal is to gain insights into your understanding, experiences, and viewpoints on issues related to how underground bins are managing solid waste. Please be assured that your responses will be kept strictly confidential and used solely for academic purposes.

Instructions:

• Please fill in the space provided

☐

• Place a tick where appropriate

SECTION A: DEMOGRAPHIC DATA

1. Age group

Below 25years   26-45 years   46-65 years   66 and above

2. Marital status

Single   Married   Divorced   Separated   Widowed

3. Level of education

Primary   "O" Level   "A" Level   tertiary

Other (state)…………………...

1. Household/ family size

2. Period of residence in the area?

3. Main economic activity?

SECTION B: UNDERGROUND BINS KNOWLEDGE

5a) Have you ever heard about underground bins?

YES   NO

b) Based on your understanding what are underground bins?

…………………………………………………………………………………………......

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c) What are the causes of undesignated landfills?

no waste collection   ignorance   no strict policy of solid waste

Other (specify)………………………

6. What is the evidence or indicators or change that is brought about by the underground bins?

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7. How are underground bins affecting the health impacts of people?

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8. What are the positive effects brought about by the underground bins?

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9. What are the negative changes brought about by the underground bins?

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SECTION C: THE EFFECTIVENESS OF UNDERGROUND BINS

10. What improvements or changes should be made to underground bins?

11. What good are underground bins bringing to the environment?

12. Are there any awareness and education programs being done about the underground bins?

a) In your perspective elaborate on the effectiveness of what is being taught.

13. What are the challenges that you are facing in trying to cope with underground bins?

Religion

Gender roles

Lack of power

Lack of education

Lack of access to decision-making

THANK YOU SO MUCH FOR YOUR CO-OPERATION.

Report

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