



**BINDURA UNIVERSITY OF SCIENCE EDUCATION**

**A WORKING MODEL FOR SUSTAINABLE E-WASTE RECYCLING IN SMALL-  
SCALE RETAIL AND MANUFACTURING: A CASE STUDY OF MAGABA,  
MBARE**

**BY  
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QUALIFICATION**

**BINDURA, ZIMBABWE**

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## DECLARATION

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DATE: 06.11.25

## **DEDICATION**

This research project is dedicated to all my family members who supported me throughout the journey, and above all to God

## **ACKNOWLEDGEMENTS**

I would like to thank the Almighty God who afforded me this chance to finish the journey.

I would also like to acknowledge my supervisor Dr. Matambo for the tremendous support, patience, and advice he gave me. Without his unwavering support I would not have managed to get through with this. His assurances gave me the strength to finish this project no matter what the circumstances. I thank him.

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To the Holy Spirit, Tatenda, Siyabonga, Thank you

## ABSTRACT

Global increase in the adoption of technology has become a critical area of concern for developing countries that do not have adequate systems for creating electronic waste management and the right infrastructure for recycling this growing electronic waste which leaves much of the recycling to the informal sector. Small-Scale retailers at Magaba have not yet created collection points for e-waste which makes it very difficult for e-waste to be efficiently collected. Three research objectives set were to assess the current state of e-waste management at Magaba's small-scale retailers, to examine barriers to effective e-waste recycling in Magaba, and to design a sustainable e-waste management model tailored to the needs of the small-scale retail sector at Magaba. The research adopted three theories whereby the theoretical framework integrated concepts from Sustainability Theory by Elkington (1994), Stakeholder Theory by Freeman, (1984), and Entrepreneurial Business Model Innovation by Christensen, (1997) in guiding the development of the sustainable business model e-waste management. The conceptual framework was adapted focused on creating circularity in the electronic waste management at Magaba with the idea of enforcing recycling and reusing with stakeholders getting incentives to participate in the model. An interpretivist paradigm was used and qualitative research approach was used which enabled the researcher to explore the actual living experiences of small-scale retailers. The case study research design was chosen. Purposive sampling was used to select 30 participants and data collection was carried out using in-depth interviews, focus group discussions and observation. The findings indicated that the current system of e-waste management in Magaba is primarily informal, unsystematic, and lacks environmental safeguards. Electronic waste, mainly old cellphones, radios, computers, and TVs is dismantled and sold by informal recyclers using crude methods. Small-scale retailers contribute to both e-waste generation and informal reuse, but there are no structured take-back systems or regulated recycling facilities. The research identified key barriers including lack of policy enforcement, low public awareness, absence of incentives, unsafe handling methods, and exclusion of informal actors from formal systems. These challenges reinforce the stagnation of e-waste management in Magaba. The developed model has inputs including discarded electronics, actor (small-scale retailers, consumers, informal recyclers), and incentives. The outputs include recycled raw materials, refurbished devices. The researcher recommended that the government and Harare City Council should set up localized e-waste drop-off centers in Magaba, supported by both government and private stakeholders. The researcher recommends further research to explore effective strategies for integrating informal recyclers into formal waste systems without disrupting their livelihoods.

**Keywords:** Electronic Waste Management, Small-Scale Retailers, Recycling, Magaba

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## **CHAPTER ONE: GENERAL INTRODUCTION**

### **1.1 Introduction**

Global increase in the adoption of technology has boosted people's standards of living. However, it has also become a critical area of concern for governments and environmentalists as the accumulation of electronic waste (e-waste) has been at its all-time high. The aim of this research was to come up with a working model that could help to reduce environmental burdens posed by electronic waste through bringing in the element of circularity in use of electronic gadgets. The research was carried out at Magaba, which is a small informal and unregulated market in Mbare that is highly dominated by informal small-scale retailers and manufacturers. The first chapter introduces the study with much focus on detailing the background behind the problem identified. This will be followed by the outline of the research problem, objectives, research questions and the justification for carrying out the study. Significance of study, delimitations, assumptions and limitations are resented in this chapter.

### **1.1 Background of the Study**

The consumption of electronic devices has risen significantly over the last ten years as technology has taken over all aspects of life from education, work, commerce and communication (Bosamia, 2023). All households in today's world are packed with electronic devices in the quest to chase better and comfortable living as modernity grips. The knowledge era has been transformed completely by the use of technology and the use of electronic gadgets in communication, transport and entertainment pushing consumers to acquire gadgets such as cellphones, televisions, radios and other gadgets that enhance people's lives. The life span of these gadgets is very short as constant changes in use and form force people to constantly change their gadgets from time to time. These changes have transformed the pace of growth in development and economic growth, but at the same time, the discarded electronic gadgets scatter the environment as they do not decay or people in many countries have not yet figured out how to dispose of them. Stiff competition has arisen in firms that produce electronics leading to constant changes in the form and shape of electronic devices time and again, which as a result lead to these gadgets having less life spans and as a result electronic waste rise at an unprecedented level (Kumar et al., 2022).

### **1.1.1 Global Perspectives on E-waste Management**

China is the largest e-waste generator in the world. In 2020, 14 Mt of e-waste were generated, an amount predicted to grow to more than 28 Mt by 2040 (Zeng et al., 2020). The country underwent substantial changes as a result of several initiatives and the establishment of national legislation for e-waste management (Awasthi et al., 2019). These efforts have brought significant improvements, which led the United Nations Environment Assembly to promote China as a model for e-waste management in 2016 and to consider its several lessons for international replication (Chen et al., 2018). In the period from 2012 to 2020, a total of 21.9 billion Chinese Yuan (CNY) was delivered in subsidies to e-waste recycling companies, and around 600 million units (including televisions, refrigerators, washing machines, air conditioners, and personal computers) entered the formal recycling channel (MEESCC, 2021). The number of licensed e-waste recycling companies established in some districts such as Guiyu grew by 87 percent from 2012 to 2023 (Schneider and Zeng, 2022). Despite the increase in the number of licensed companies, the formal sector is still far from achieving the full capacity to recycle the e-waste generated in the country, and most of the e-waste is estimated to be processed by the informal sector.

Furthermore, a United Nations Environmental Programme (UNEP) titled, 'Recycling - from e-Waste to Resources' indicates that 20 – 50 million tonnes of e-waste is generated each year worldwide (with the USA alone generating about 30 tonnes) and 200 million TV sets and one billion pieces of computer equipment will be disposed each year for the rest of this decade (UNEP, 2020). Surprisingly, these figures are exclusive of the volume of waste from the mobile phones. In many parts of the world such as United States, and Europe, there has been a change in focus with a rapid increase in electronic management as this technological consumerism started way back compared to poor economies such as those in the middle east and Africa creating a hub of activities pushing up economic growth in the big economies. These big and more advanced economies have come up with technologies that bring efficient collection of electronic waste (e-waste), disposal as well as recycling of these gadgets. This is driven by policy frameworks that regulate e-waste management such the European Union's Waste Electrical and Electronic Equipment (WEEE) Directive (Kumar et al., 2022). These countries have created business models centered around Extended Producer Responsibility (EPR), that make it a point that manufacturers ensure there is a sustainable end-of-life management of electronic wastes. These models are created based on circularity principles whereby integration of end users and creators of this

technology can reduce environmental footprints, reduce environmental impact and bring social improvements through job creation through recycling (Forti et al., 2020). The only challenge faced in all countries stems from unwillingness by consumers to fit in well in the circular economy due to lack of awareness and reluctance to engage with recycling programs (Forti et al., 2020).

### **1.1.2 African Perspective on Electronic Waste Management**

Developing countries, particularly Africa, have been disproportionately affected by e-waste generation. Gollakota et al. (2020) make this observation and conclude that while Africa does not produce much e-waste, the continent has become the dumping ground for discarded electronics from the developed world. Akese and Little (2018) refer to the exportation of hazardous waste from developed countries to impoverished developing countries as “toxic colonialism”. This is reflective of the exploitative dynamics at play. It captures the unfair cross-border transfer of environmental burdens to developing regions saddled with infrastructure challenges for this waste stream's safe disposal or recycling. For instance, according to Merem et al. (2021), Ghana and Nigeria received 77 percent of the e-waste from England and Wales alone in 2019.

There are a lot of electronic wastes generated from electrical equipment in Nigeria (Schluep, et al., 2021). These imports, about 60,000 tons per year, worsen the challenges of electronic waste (E-waste) management (Akese and Little, 2018). Wastes that are released to the environment as a result of utilization of electrical and electronic equipment are the greatest increasing waste across the globe. The rate of growth is from 3% to 5% yearly in most countries. 6.1kg per capita of waste translates to 44.7 million tons of electronic waste globally. Though E-waste is categorized as hazardous waste, unlike other wastes, it has notable potential for circular economy and value recovery (ACET, 2025). Lagos is one of the greatest economic cities of the world with a lot of waste and population explosion and air pollution. With about 17.5 million people, the local consumption of electrical and equipment (EEE) reached high levels (ACET, 2025). Agbogbloshie market in Ghana show that annual income of more than 300 million is generated from informal recycling and similar findings also indicate an employment level more than 200 000 people directly or indirectly (Gollakota et al., 2020). The informal recycling center in Ghana is said to be the second largest area for electronic waste recycling in the West Africa.

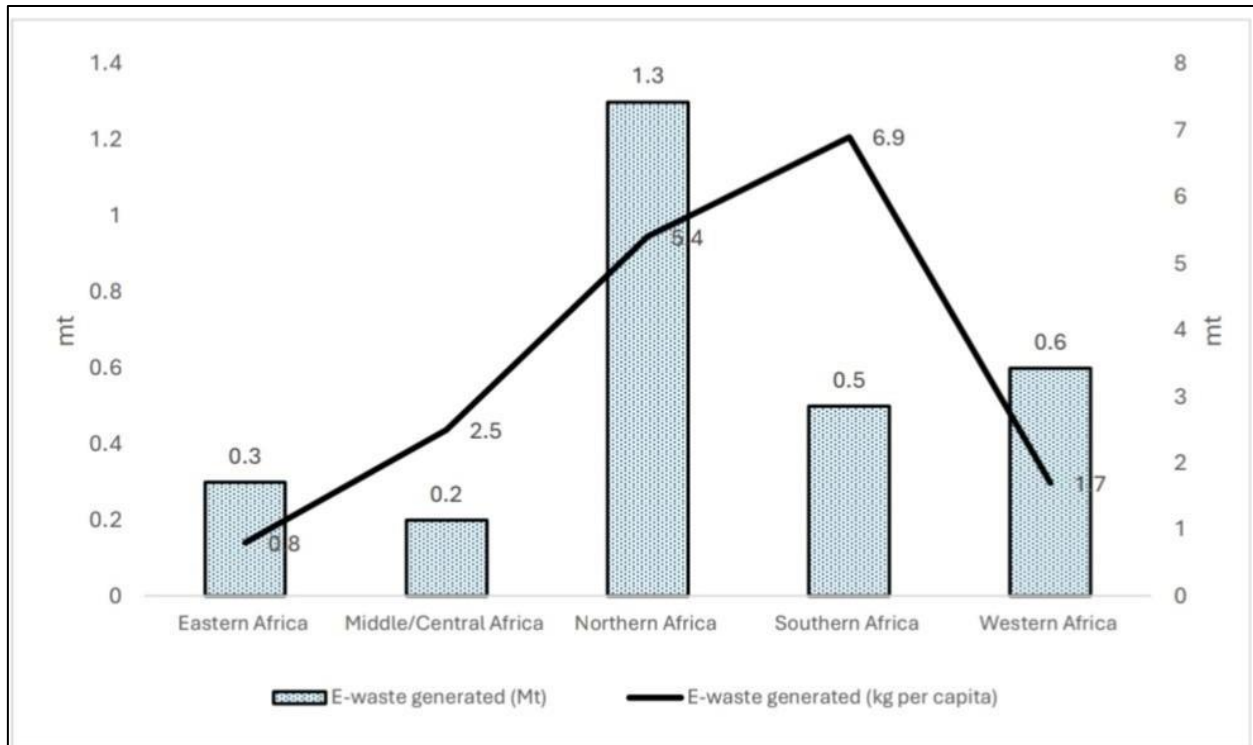


Figure 1. 1 Africa's e-waste generation

**Source: Balde et al., (2017)**

According to Baldé et al. (2017) and Forti et al. (2020), Africa generates an average annual 2.5 kg of e-waste per capita, well below the European annual average of 16.2 kg and the Americas' 13.3 kg. In 2019. Figure 1.1 shows a regional breakdown of e-waste generation in Africa. According to Daum et al. (2017), a significant portion of e-waste imported into Africa arrives under the banner of “charitable donations” and “second-hand goods”, presupposing that they must be functional and usable, but the data suggest otherwise. For instance, Maes and Preston-Whyte (2022) reveal that out of 0.215 tonnes of e-waste imported into Ghana in 2019, 30 percent comprised usable “new” products, an additional 14 percent was second-hand needing possible repair, leaving a staggering 56 percent as actual waste in need of processing. Although the percentage of usage of e-waste differs, it has been shown by Schluep et al., (2021) that it typically does not exceed 30 percent. Maphosa and Maphosa, (2020) report that out of the approximately 400,000 used computers that enter Nigeria every month, only around 50 percent still function. The foregoing presupposes that most imported e-waste in Africa arrives near or at the very end of its end-of-life stage, highlighting the need for sustainable management to avoid adverse environmental and social impacts.

Many African countries have been at the mercy of developed countries as developed countries dump gadgets, they no longer need through selling as second-hand gadgets (Godfrey et al., 2021). This is exacerbated by the growing inequalities amongst populations in the world which has seen countries that are gaining wealth through exporting second-hand gadgets approach their end of shelf life to poor countries in Africa (Jinhui et al., 2023). Developing countries do not have adequate systems for creating electronic waste management and the right infrastructure for recycling this growing electronic waste. This leaves much of the recycling to the informal sector and these informal recyclers do not have proper ways of retrieving precious minerals that are found in electronic devices thrown away (Grant & OtengAbabio, 2022).

In West Africa, large economies including Nigeria have become a significant destination for electronic gadgets imports from developed countries, leading to environmental and health concerns as these countries resort to informal recycling systems (Grant & OtengAbabio, 2022). This is a sharp contrast to what developed countries are doing. This has led to the growth in the need for models that ensure sustainable management of electronic waste, and the need to formalize informal systems (Grant et al., 2019). There are several barriers towards the development of such a sustainable circular economy such as the lack of the regulatory framework as enforcement is very weak and, in some circumstances, it is nonexistent which complicates the transition to sustainable practices (Agyei-Mensah & Oteng-Ababio, 2019).

Developed economies dump used electronics through exports to poor economies extending their end-of-life period and at the same time it is well-received in many African countries as this is what many can afford. These second-hand electronic gadgets quickly become obsolete leading to an accelerated accumulation of electronic waste. Poor electronic waste management in these poor countries is a huge gap between sustainable use of resources and the environment, with the environment suffering. Therefore, it was found that Africa as a whole continent only accounts for less than one percent of formal recycling of e-waste which is way below the global average of thirty percent which was set for 2023 (Forti et al., 2020). Various researchers have reported that heavy metal contamination coming from unsafe e-waste recycling methods brings both health and environmental risks.

### **1.1.3 Southern African Perspective on Electronic Waste Management**

Estimates of South African e-waste production varies tremendously. The Global E-waste Monitor reports that 321 000 tons of e-waste was generated by South Africa in 2016 (GreenCape, 2020). By contrast, a study by Finlay (Godfrey et al, 2021) in 2020 estimated e-waste generation to be between 1.12Mt and 2.1Mt per annum, a sixfold increase over the Global E-waste Monitor estimate. These estimates can tend to be inaccurate, especially in an African context, where the base data is unreliable (GreenCape, 2020). A study conducted by Lydall, Nyanjowa and James (2024) found that only 17 733 tons of e-waste was declared as processed, representing a small percentage of total e-waste generated. Regardless of the e-waste production estimates in South Africa, it is clear that there is a significant opportunity to increase the percentage and volumes of e-waste that enter the recycling system (Sadan, 2019).

In the SADC region, electronic waste management varies significantly for example countries such as South Africa have made several steps in creating formal recycling systems that deal with electronic waste and this is supported by both the government and the private sector (Dhokhikah et al., 2021). This is not the case with other African countries who are still miles backwards in terms of management of electronic waste as recycling is currently under an informal system dominated by the informal sector and the lack of infrastructure as well as limited public awareness about e-waste's environmental impact. Dhokhikah et al., (2021) argue that there's a need to create regional cooperation to harmonize e-waste management policies, which could facilitate the development of a more integrated and sustainable recycling systems.

Gweme et al (2018) asserts that in Zambia, e-waste is handled by persons who do most of the repairing and reusing of electronic equipment. The simple processing of electronic waste involves serious health and pollution risks (Sanana and Mwanza, 2024). According to the Zambia Environmental Management Agency (ZEMA), only a small percentage of e-waste is being recycled. Sometimes, Zambia sends its electronic waste to South Africa for disposal (Sanana and Mwanza, 2024). According to Gweme (2016), there exist no minimum specifications for second-hand equipment in the fields of Information and Communication Technologies. As a result, second-hand computers received in Zambia are often not fit for purpose and even if second-hand electronic goods are usable, their limited lifespan accelerates their descent into e-waste (Sanana and Mwanza, 2024). Shipping of used computers to African countries often represents dumping.

Second-hand computers, whether usable or not, often end up in the informal sectors of the economy. Here computers sustain informal employment and a livelihood. Due to its nature, the informal sectors are rather immune to government policies and regulations.

#### **1.3.4 Zimbabwean Perspective on Electronic Waste Management**

In Zimbabwe, e-waste management has not yet gathered momentum. There are various small-scale fragmented e-waste management systems in Zimbabwe. Maphosa and Maphosa, (2022) reported that in areas that are more populated such as Magaba, informal recyclers do e-waste management with no government or council support. At Magaba, retailers who dominated the electronic selling market have not yet created collection points for e-waste which makes it very difficult for e-waste to be efficiently collected and leaves these retailers out of the e-waste management system making this an open loop. This realization makes the e-waste management system adopted by few informal recyclers a very ancient and unsustainable system that plays a very insignificant role in environmental protection against e-waste. Li et al., (2023) supported this idea by saying that these informal systems are characterized by the use of ancient tools such as chisels and hammers in retrieving precious materials from discarded electronic gadgets, which is very common at Magaba. Also, residents of Magaba and other surrounding areas do not realize the economic value from recycling and the environmental damage posed by informal recyclers (Jinhui et al., 2021; Maphosa & Maphosa, 2022). Therefore, the absence of proper e-waste recycling systems at Magaba and the greater part of Zimbabwe makes it very difficult to gather data about e-waste recycling which becomes a gap that this research aims to close. The only countries in Africa that have created e-waste infrastructure and other integrated e-waste management systems, such as South Africa, Egypt, and Rwanda, have data on e-waste management that can be used to mirror the Zimbabwean society (Grant and Oteng-Ababio, 2022).

The growth of the informal economy such as Magaba where many operations are not formalized and haphazard making e-waste recycling primarily informal and unsustainable as there is little to no structured approach towards managing the e-waste stream (Muzenda et al., 2020). At Magaba, there is a lack of knowledge, financial resources and the right infrastructure to create a sustainable e-waste recycling system. The existence of scattered waste dumps full of discarded electronic gadgets such as phone accessories, radios and television sets shows that there is a need to have in place a more sustainable way of dealing with e-waste which this researcher focuses on developing.

The development of a sustainable business model that reduces environmental impact of e-waste does not only address environmental concerns but can also become the economic turnaround for many small-scale retailers at Magaba (Muzenda et al., 2020). Magaba has informal recyclers who cannot keep up with the ever-increasing use of electronic gadgets leading to a sharp rise in e-waste. The environmental problems come into this area as there is no efficiency in the current recycling efforts by small scale recyclers due to several factors including lack of funding, lack of awareness by consumers, and lastly, the lack of economic incentive to keep on recycling these materials.

In Zimbabwe there are no clearly defined e-waste management policies that support the development of proper e-waste disposal, and this is coupled by the absence of advanced infrastructure that can be used efficiently in e-waste recycling (Mutsau et al., 2023). This has impacted negatively the creation of policies for e-waste recycling at firm level including amongst small scale retailers which leads to proliferation of poor e-waste management (Maphosa and Maphosa, 2020). The outcome of all this is the indiscriminate disposal of e-waste at institutional and individual levels (Maphosa, 2020). The result is the overburden of the environment with e-waste and at one moment the same environment will give-in leading to health hazards. The evidence of unsustainable disposal of e-waste at Magaba is the burning of e-waste as they cannot decompose at various dumpsites leading to release of dangerous toxic metals into water bodies (Chitotombe, 2022). Therefore, it is critical to understand several issues that are helping to create efficient e-waste management as the growth of knowledge in this area reduces the risk of e-waste accumulation. The developed model from this study will become a center of policy focus with Magaba becoming a role model.

The absence of reliable data and modern systems, the proper management of electronic waste at informal areas such as Magaba has necessitated the carrying out of this research to avert a critical environmental disaster that may arise in the near future. There are gaps in data and policy implementation and or its existence. The widening gap between developed economies and emerging economies needs to be closed by developing modern systems that can also create economic power for society. It is from this background that the researcher aims to develop a sustainable business model that solves e-waste recycling problems at Magaba to mitigate environmental hazards and create economic opportunities, that can also work as a model that can be adopted all over the country.

## **1.2 Problem Statement**

Small-scale retailers that are operating at Magaba in Mbare lack proper e-waste recycling leading to the proliferation of e-wastes in the form of cellphone parts that are thrown away, radio parts and other consumables for electronic gadgets that are mainly sold or repaired by retailers in the township. The accumulation of such e-waste poses environmental and health risks to people living in and around Magaba. Small-scale retailers who are more involved in the sale of electronic gadgets are not playing their role in e-waste collection and ultimate recycling (Maphosa & Maphosa, 2020). With these discarded materials scattered all over the environment, they pose environmental pollution which is a health hazard in the long run, and many valuable materials lost can be recycled or recycled. The identified problem warranted the researcher to come up with this research which aims to come up with a solution through designing a sustainable model for e-waste recycling amongst small-scale retailers.

## **1.3 Main Research Objective**

The primary objective of this research is to develop a sustainable model for e-waste recycling in Magaba's small-scale retailers.

### **1.3.1 Specific Research Objectives**

The specific objectives are:

1. To assess the current state of e-waste management among Magaba's small-scale retailers.
2. To examine barriers to effective e-waste recycling in Magaba.
3. To design a sustainable e-waste management model tailored to the needs of the small-scale retail sector at Magaba.

## **1.4 Research Questions**

The research seeks to answer the following research questions:

1. What is the current state of e-waste management among Magaba's small-scale retailers?
2. What are the main barriers to effective e-waste recycling in this sector?

3. How can a sustainable e-waste management model for e-waste recycling be developed for the small-scale retail sector at Magaba?

### **1.5 Research Justification**

Developing a sustainable business model for e-waste recycling at Magaba's small-scale retailers is supported by other researchers and data that underscores several critical points. From the 2024 UN report, there is a large accumulation of e-waste which is generated five times faster than it is being recycled in African countries, with Zimbabwe having a recycling rate of less than one percent (UN, 2024). This rapid increase in e-waste generation is driven by the growing consumption of electronic goods, which is not matched by corresponding recycling infrastructure. The informal sector at many markets that are dominated by informal activities such as Magaba have a very important role to play in the recycling of electronic waste. In research carried out in 2022 on household solid waste practices in Zimbabwe, it was highlighted that informal recycling can be very instrumental in e-waste management efforts which provides several economic benefits and at the same time reducing environmental pollution (Muisa-Zikali, et al., 2022). The researcher notes that these practices are poorly managed and are often hazardous, which can lead to significant health risks.

There is a gap in research on how small-scale retailers at Magaba can contribute to efficient management of electronic waste disposal as more research focus has been on greater urban centers and other countries with scant literature towards informal economies such as Magaba. The current study would not only close the research gap but also provide a sustainable model that could be adapted in other areas outside Magaba that are facing similar challenges. Therefore, the justification for this study is rooted in the urgent need to manage the growing e-waste problem at Magaba, leveraging the small-scale retail sector's potential for economic and environmental benefits. By developing a business model that incorporates recycling, this research could lead to more sustainable practices, policy reforms, and contribute to the global push towards a circular economy.

## **1.6 Significance of the Study**

Findings from this study can be adopted by various stakeholders who are interested in environmental management such as policymakers, small-scale retailers, and other environmental organizations by providing a framework for sustainable e-waste management.

### **1.6.1 Significance to Policy Makers**

Research findings will provide empirical evidence to help in the formation or amendment of management policies pertaining to e-waste, particularly those targeting small-scale enterprises and informal recyclers. The findings can guide policy makers to come up with environmental regulatory frameworks that encourage recycling which helps to reduce environmental footprints and promote a circular economy. Some of the initiatives that policy makers can get insight from this research include the impact of lack of funding in e-waste management which can therefore lead to harnessing of resources to propagate better waste management systems. Also, by demonstrating the economic and environmental benefits of sustainable e-waste management, research can advocate for legislative support for recycling infrastructure, tax incentives, or grants for small-scale recyclers.

### **1.6.2 Significance to the Academia**

The research is centered on informal contexts with particular focus on the growing informal markets such as Magaba in Mbare. The study setting closes the literature gap that has been left by many researchers which means there is the creation of new knowledge in environmental science, business, and sustainability studies. The proposed business model can add value to the already existing theories and models such as the circular economy models, and the role of micro-enterprises in environmental management, thereby bringing in new framework for understanding the importance of small-scale retailers as agents of change.

### **1.6.3 Significance to Theory**

The research output is a business model that is going to be implemented in a poor community setup and advancing the economic status of poor communities through creating sustainable living. This can be seen as advancing of the theoretical understanding by providing a practical example of how circular economy principles can be implemented at the grassroots level, offering insights into the

challenges and opportunities of such transitions. The researcher attempted to create a link between the concept of behavioral economics and retailer behavior which adds to the existing theory as it shows how incentives and education can drive sustainable practices.

#### **1.6.4 Significance to Small-Scale Retailers**

Retailers play an integral role in this research as they are distributors of electronic gadgets. Therefore, by creating a business model that focuses on them, this sector can use the research findings to be more innovative, potentially leading to new revenue streams through recycling. Small-scale retailers, waste managers, and recycling companies can adopt the business model from this study to improve their operations, making e-waste management more systematic and less harmful thereby reducing their environmental footprints.

### **1.7 Research Assumptions**

The following assumptions were made in carrying out this research: Sufficient and accurate data on current e-waste practices in the small-scale retail sector can be gathered to inform the development of the business model, the technology required for basic e-waste recycling can be made accessible and affordable for small-scale retail operations, either through local innovation or partnerships, and small-scale retailers can achieve economic benefits from recycling e-waste by reducing disposal costs, selling recovered materials, or through government incentives for sustainable practices.

### **1.8 Research Delimitations**

The research was delimited to Magaba informal settlement, covering a one-year period, was carried out under three theories and used qualitative methods in data gathering. These delimitations are explained in detail in this section

#### **1.8.1 Geographical Delimitation**

This research was delimited to Magaba informal market in Mbare, which is in Ward 4. The ward is known for its vibrant informal sector, including numerous small-scale retail outlets and markets selling electronic goods, which are potential sources of e-waste.

These retailers are typically characterized by limited store size (less than 500 square feet), owner-managed or with minimal staff, and stocking a limited variety of items, often focusing on daily use electronics.

### **1.8.2 Time Delimitation**

The research covered a time frame of one year, from January 2024 to December 2025. This period allowed for assessing the impact of any recent policy changes or technological advancements in e-waste management. Capturing data on trends in electronic consumption, disposal practices, and recycling behaviors within this specific time frame.

### **1.8.3 Theoretical Delimitation**

The three theories applied in this research include: Sustainability Theory by Elkington (1994), Stakeholder Theory by Freeman, (1984), and Entrepreneurial Business Model Innovation by Christensen, (1997). These were the only theories considered in this research.

### **1.8.4 Methodological Delimitation**

The research was carried out under qualitative research methods and did not apply quantitative methods and mixed methods in gathering data.

## **1.9 Limitations**

Due to the vast number of small-scale retailers and the informal nature of many operations, obtaining a sample that was truly representative of the entire sector was challenging. This might have affected the generalizability of the results. To reduce the impact of this on results, the researcher included a large number of stakeholders and as well used the mixed methods approach. Collecting reliable data from informal sectors could have been affected by issues including the reluctance by participants to share information due to the informal or unregulated nature of their businesses, or due to distrust of research intentions. In order to reduce the impact on findings, the researcher explicitly indicated that this research was for academic purposes and was carried out under the ethical consideration of anonymity and confidentiality.

### 1.10 Definition of Key Terms

The following key terms are defined as:

**E-waste:** Is defined as any end-of-life or end-of-use piece of equipment which is dependent on electrical currents or electromagnetic fields in order to work properly (UNEP, 2020).

**E-waste Management:** E-waste management refers to handling and managing electronic waste, such as phones, computers, tablets, and more (Altomonte, 2025). E-waste is currently the fastest-growing waste stream worldwide, which is why it's important for us to find ways to manage the waste before it gets too late.

**Small-scale retailers:** Small-scale retailer is defined as one with a relatively small share of the market, managed by its owners in a personalized way, independent, it means is not forming part of a larger enterprise, and having few employees (Beranová, 2018).

### 1.11 Structure of the Thesis

The thesis comprises five chapters, with Chapter One providing the introduction, background, problem statement, research problem, significance of the research, delimitations, limitations and assumptions of the research. Chapter Two presents a literature review covering the theoretical framework, e-waste management, circular economy principles, informal recycling models, and case studies from developing countries. Chapter Three details the qualitative methodology, including interviews, observation, used in gathering data in the research. Chapter Four reports the findings and analysis through a thematic structure of current practices and challenges, while Chapter Five discusses the results, presents the proposed working model with a diagram, and offers conclusions and recommendations.

### 1.12 Chapter Summary

The chapter examines the context of the research problem, the problem statement, the study's purpose, its objectives, and its questions, as well as its significance, its delimitations, its limitations, its research assumptions, its justification, its purpose, and its structure. The review of the literature on e-waste management by small-scale retailers will be covered in the next chapter. This includes both theoretical and empirical research.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

The previous chapter introduced the research detailing research background and problem statement. This chapter presents literature review of the research. The focus is on the theoretical framework which is based on three theories. This is followed by the conceptual framework which details the proposed business model and its outcomes. The chapter also presents empirical review of the barriers faced world over in e-waste management. This is followed by the research gap that is found through analysis of research and models carried out by other researchers.

#### **2.1 Electronic Waste**

The surge in e-waste has brought complex definitional and practical challenges requiring specialized and creative economic approaches to handling and disposal policies to mitigate the harmful effects. The 2024 E-waste Monitor defines electronic waste as products with circuitry or electrical components and a power or battery supply. It is important to note that electronic equipment becomes e-waste generally when it is unusable to the owner. According to UNEP, (2020), e-waste can be defined as any end-of-life or end-of-use piece of equipment which is dependent on electrical currents or electromagnetic fields in order to work properly. According to Li et al. (2022), e-waste covers a broad spectrum of electronic objects, including household appliances, medical devices, control and monitoring instruments, lighting devices, automated dispensing units, consumer electronics such as recreational devices, sports equipment, mobile phones, and computers. According to Chen et al. (2023), and Lambert et al. (2024), it includes electronic equipment components from electrical cables taken out of end-of-life vehicles, plastic housing, cathode-ray tubes, activated glass, lead-based capacitors, batteries, and printed circuit boards. Therefore, in the current study, the UNEP definition was adopted and components of electronic equipment defined by Chen et al., (2023) and Lambert et al., (2024) were adopted.

## **2.3 Theoretical Framework**

The theoretical framework integrates concepts from Sustainability Theory by Elkington (1994), Stakeholder Theory by Freeman, (1984), and Entrepreneurial Business Model Innovation by Christensen, (1997) to guide the development of a sustainable business model for e-waste recycling at Magaba's small-scale retail sector.

### **2.3.1 Sustainability Theory**

The theory creates a balance between environmental issues, economic issues and social issues in the quest to create a long-lasting solution to economic problems through innovation. The current research is centered on creating a business model that solves e-waste management problems which therefore put environmental dimensions on sustainability into the picture as it emphasizes the need to reduce and have in place a proper recycling system. This aligns with the need to mitigate pollution, conserve resources, and reduce toxic elements being emitted into the atmosphere. The economic dimension focuses on creating a financially sustainable model that generates revenue while covering operational costs (Maphosa and Maphosa, 2022). This includes identifying value streams from recycled materials and exploring market opportunities for refurbished electronics. The social dimension ensures that the business model benefits local communities by creating jobs, improving public health, and raising awareness about e-waste management. In carrying out this study, the researcher aimed at developing a model that had all the elements of sustainability.

Some of the key actions from this theory include establishing points for e-waste collection along the small-scale retail hubs in Magaba (Baldé et al., 2020). Adding on to this, there is need to partner with certified facilities for recycling of electronic waste so that they can be safely processed (Baldé, et al., 2020), and at the same time educate retailers and consumers on the environmental impact of e-waste. Therefore, in coming up with this business model, the main aim was to address social issues such as equity that arise in every society, through creating employment opportunities, creating community engagement and uplifting health and safety. The model developed will achieve this through targeted training of workers from Magaba in electronic waste collection and teaching them basic techniques of e-waste recycling. Awasthi, et al., (2021) asserts that in e-waste management, there is need to create safe working conditions for people involved in handling e-waste. The model must ensure financial viability by creating revenue streams from recycled

materials, reducing costs through efficient operations, and attracting investment. According to research by Awasthi, et al., (2021) which was focused on e-waste management in Nigeria, they concluded that societies need to come up with profitable ways of selling materials that are recovered from e-waste for example creating relationships with manufactures so that they can buy back these materials and use them again in manufacturing new products.

Therefore, the theory was found to be integral in the development of a business model in e-waste recycling as it brings together the core aspects of the community, namely the environmental aspect, economic aspect and social aspect. The balance that is created if the model incorporates these pillars can make the model to be more sustainable, especially for communities that are grappling with the environmental issues of pollution, economic issues of high unemployment and social issues of uncaring consumer behavior. In coming up with this model, it was envisaged that the pillar in the theory makes it a perfect fit.

### **2.3.2 Stakeholder Theory**

The theory is centered on the importance of stakeholders in the implementation of development projects such as the development of a business model that aims to increase e-waste recycling (Onac, et al., 2020). Other researchers who applied the same theory include Oteng-Ababio et al., (2020), Etikan et al., (2016) and Bockan et al., (2019) making it more relevant in the current research. There are many stakeholders in e-waste recycling at Magaba such as retailers, consumers, local recyclers, policy makers and the community. Small scale retailers are the primary generators of e-waste as they are mainly involved in selling electronic products to consumers. Any effort to create sustainable business model for e-waste recycling without this important stakeholder would not make much sense as their participation in collection and recycling initiatives is critical (Islam & Huda, 2019). Consumers as users of electronic gadgets play an important part in collecting e-waste therefore raising awareness among this group of stakeholders about the importance of proper e-waste disposal and incentivizing their participation was found to be more important.

The government and other regulatory bodies are significant stakeholders in e-waste management as pollution has a great impact on the economy. The government, being a signatory to various international treaties on waste management, is an interested stakeholder in the development of a

sustainable business model for e-waste recycling. Also, collaborating with local authorities such as the Harare City Council to align with regulations and secure support for e-waste management initiatives was found by the researcher to be of utmost importance. In carrying out this research, it was envisaged that there are already efforts by informal and some formal players in e-waste recycling but was found not to be enough. Therefore, those already in the e-waste recycling are part of the stakeholders including those with expertise in e-waste management. Lastly, this model will solve community problems as well as create income for the members of the Magaba community. In this regard, the researcher included some community members as stakeholders in this research.

### **2.3.3 Entrepreneurial Business Model Innovation**

Entrepreneurial business model innovation is critical for addressing complex challenges such as e-waste management, particularly in resource-constrained settings like Magaba's small-scale retail sector (Maphosa & Maphosa, 2022). Developing a sustainable business model requires innovative approaches tailored to the local context. The model incorporates the entrepreneurial effort in coming up with modern ways of doing activities and in this case the need to come up with a new model that solves e-waste recycling problems at Magaba. The innovation created does not only address the main problem of e-waste recycling but brings vast economic opportunities which therefore improve people's standards of living at the same time addressing environmental problems. The theory was chosen in this research as it is centered on three major components of value proposition, creation and capture as shown by (Foss & Saebi, 2020). Value Proposition in the theory represents the proposed business model which aims to bring a solution to e-waste management problems whilst coming up with increased value in coming up with this model (Maphosa and Maphosa, 2020).

The value creation aspect comes in the form of new opportunities in terms of jobs, increased investment opportunities, reduced reliance on virgin resources and the increased collaboration among different stakeholders. This value creation can translate to increased economic activities around Magaba area which leads to high economic growth in the area. The value creation aspect extends to community engagement through creating a closed-loop system where everyone in society contributes to the betterment of their community. Lastly, value capture is concerned with

the generation of vast revenue through recycling efforts at Magaba that can run into millions. This is enhanced through reducing costs as logistics are tailored to suit the model and the engagement of the community in the collection of e-waste and through various collection points dotted around Magaba and managed through retailers.

## **2.4 Current State of E-Waste Management among Small-Scale Retailers in Other Countries**

### **2.4.1 Lagos, Nigeria – Informal Sector E-waste Management**

A study in Lagos explored how informal recyclers manage e-waste in markets. It found that, despite poor working conditions, these actors played a crucial role in resource recovery (Ogunseitan et al., 2019). The research led to a model integrating informal workers into a formal system through training, safety support, and municipal recognition. Ogunseitan et al. (2019) conducted a comprehensive study on how the informal sector contributes to e-waste recycling within markets and urban settlements. The research focused on Alaba International Market which is one of the biggest electronics hubs in West Africa, where informal workers collect, sort, dismantle, and resell parts from discarded devices (Ogunseitan et al., 2019). The study revealed that the informal sector handles over 70% of e-waste in Lagos without regulatory oversight, using crude methods such as open burning and acid baths to recover metals like copper and aluminum (Owusu-Sekyere, et al., 2022). This practice, while economically beneficial to low-income earners, poses serious health and environmental risks. Nigeria faces significant hurdles despite progress.

As Africa's largest importer of electrical and electronic equipment, the country processes over 500,000 tonnes of discarded electronics annually (ACET, 2025). Informal recycling employs about 100,000 workers but often involves harmful practices that release persistent organic pollutants (POPs) and mercury, posing severe health and environmental risks (Osibanjo, 2021). Critical challenges include limited recognition and support for informal waste pickers and a lack of formalized stakeholder engagement, particularly with the Waste Pickers' Association of Nigeria (Sera, 2023). Additionally, non-compliance by some producers and insufficient awareness of the EPR scheme hinder its full implementation (Sadan, 2019).

#### **2.4.2 Accra, Ghana – Agbogbloshie Model**

In Agbogbloshie, one of West Africa’s largest e-waste dumps, a model was tested involving collection centers, recycler cooperatives, and partnerships with tech companies (Amoyaw-Osei et al., 2021). The initiative aimed to reduce health hazards while maintaining livelihoods, showing promise for replication in informal contexts. The government, in partnership with GIZ (German Agency for International Cooperation), introduced a system that connects informal collectors to formal recyclers (Amoyaw-Osei et al., 2021). Collection points were set up at key markets and repair shops to serve as e-waste drop-off locations (Owusu-Sekyere, et al., 2022). Informal workers were incentivized through a cash-for-waste system, receiving fair payments for delivering e-waste to accredited centers. This reduced the need for unsafe manual processing by encouraging proper channeling of materials (ACET, 2025).

An e-waste recycling facility was constructed at Agbogbloshie to centralize safe dismantling and material recovery. Equipped with modern machinery, this facility was intended to reduce environmental pollution while employing informal workers under improved conditions. Over 1,000 informal workers were trained in safe dismantling practices and provided with certification (Atiemo et al. 2016). They were also registered under cooperatives to give them voice and representation in decision-making processes. Despite enacting an advanced regulatory framework, Ghana has yet to adopt an e-waste policy (ACET, 2025). This is an anomaly since policy should have preceded regulation. Nevertheless, Larry Kotoe of the EPA asserts that they are currently “in the consultative phase of a specific policy” to govern e-waste.

#### **2.4.3 Delhi, India – Extended Producer Responsibility**

A case study in Delhi piloted a producer-backed e-waste model, linking informal collectors to formal recyclers (Singh & Panwar, 2020). It emphasized traceability, training, and incentives to shift unsafe practices into regulated systems. Delhi, a rapidly growing urban center in India, generates significant amounts of e-waste annually, estimated at over 90,000 tonnes (Singh & Panwar, 2020). Chaturvedi et al. (2020) examined Delhi’s efforts to create a sustainable e-waste recycling system that integrates both formal and informal sectors, focusing on the role of small-scale collectors, aggregators, and retailers. The study highlighted that over 85% of e-waste in Delhi is collected and processed by the informal sector. Informal workers, often operating in densely

populated neighborhoods like Seelampur, collect obsolete electronics, mainly mobile phones, TVs, and computers, from households, repair shops, and markets (Singh & Panwar, 2020). These are then dismantled manually, with valuable components extracted and sold.

In order to address health and environmental risks associated with the accumulation of e-waste, the government and other authorities in India together with non-profit organizations and the private sector players came up with a recycling model that was semi-formalized (Singh & Panwar, 2020). This saw the introduction of collection centers that were operated by recyclers certified and that informal e-waste collectors could easily access. There were incentives introduced whereby informal collectors were given fair compensation for collecting and delivering e-waste to these certified recyclers and other authorised centers (Singh & Panwar, 2020). The model was successful as Pradeep and Kumar, (2019) reported that there was an increase in the volume of recycled e-waste, a marked reduction in child labour as well as a reduction in unsafe practices in dismantling of e-waste. There was also an increased cooperation between stakeholders in e-waste management (Singh & Panwar, 2020).

#### **2.4.4 Cape Town, South Africa – Municipal-Community Partnership**

This study involved community-based organizations in e-waste education and collection. The city provided logistical support and linked the initiative with existing waste management frameworks, forming a hybrid model for scalable urban adoption (Makinde et al., 2020). Cape Town presents a strong example of urban e-waste management through semi-formalized systems, policy support, and public-private collaboration (Dhokhikah et al., 2021). While not as heavily dependent on informal recycling as cities like Accra or Lagos, Cape Town has developed strategies to balance formal recycling infrastructure with community-level participation, including small retailers and waste collectors. The outcome was that Cape Town's Solid Waste Department operates over 25 municipal drop-off facilities, many of which accept small electronic items such as radios, mobile phones, batteries, and old appliances (GreenCape, 2020). These are integrated into broader household waste services, providing convenience and increasing e-waste recovery rates (Godfrey et al., 2021).

Partnerships between the city and private recyclers like AST Recycling and Desco E-Waste allow the municipality to focus on logistics and public awareness, while specialized companies handle safe dismantling and material recovery (GreenCape, 2020). These firms also run community education campaigns. Retailers such as Makro and Incredible Connection participate in retail take-back schemes, where consumers can drop off old electronics when buying new ones (Ichikowitz and Hatting, 2020). Public campaigns have also promoted e-waste awareness, including mobile collection drives in townships (Makinde et al., 2020).

## **2.5 Barriers to Effective E-waste Management**

While e-waste recycling presents opportunities for resource recovery and economic growth, there are significant environmental, social, and economic barriers in creating sustainable means of managing e-waste. All over the world, these barriers exist in one form or another, bringing the world to danger of environmental danger if integrated e-waste management systems are not created. Some of the barriers being faced in e-waste management regulatory challenges, weak enforcement of laws, poor infrastructure and the growth of the informal sector, among others. These barriers are detailed in the following section.

### **2.5.1 Regulatory and Policy Challenges**

An effective e-waste management system is backed up by a strong and robust regulatory framework and policies. This can be seen not happening in many countries all over the world including in some developed economies but rampant in developing countries struggle with inadequate legislation, weak enforcement, and fragmented governance structures. In many developing and developed countries, the absence of comprehensive e-waste legislation hinders effective recycling. Awasthi et al., (2021) reports that the lack of stringent policy framework in India has led to the proliferation of informal recycling practices, often involving unsafe methods such as open burning and acid leaching. Similar systems have been reported in some African countries such as Ghana where the absence of specific e-waste laws has resulted in the uncontrolled dumping of electronic waste, exacerbating environmental and health risks (Baldé et al., 2020). As Zimbabwe and Ghana have almost similar informal economic systems and socio-economic dimensions, which makes this case study relevant to the current study.

### **2.5.2 Weak Enforcement**

Weak enforcement is a significant challenge even in those countries who have established e-waste regulations. Despite the introduction of the WEEE (Waste Electrical and Electronic Equipment) in China, directive, illegal e-waste imports and informal recycling activities persist because of the absence of monitoring and enforcement mechanisms (Wang et al., 2020). Such occurrences show that there exists a gap between the formulation of policies and their implementation leading to the continual accumulation of e-waste management problems. In regions such as the European Union there are some fragmented governance structures which complicate e-waste management efforts as there are varying interpretations and implementations of the WEEE implementation across member states which has led to inconsistencies in e-waste collection and recycling rates (Eurostat, 2021). It can be seen therefore that absence of harmonization of policies defeats the effectiveness of regional policies in e-waste management. It is likely that similar barriers can be obtained in the current study as the development of policies towards e-waste could be hindered by limited progression in terms of technology.

### **2.5.3 Lack of Advanced Infrastructure**

One of the major challenges facing the world in terms of e-waste management is the insufficient technology needed to have an efficient e-waste recycling system. Amoyaw-Osei et al., (2021) found that in Egypt there is a general lack of advanced recycling infrastructure which hinders the effective management of e-waste due to the complexity of e-waste materials, and the high cost of recycling technologies. Similar findings were recorded by Awasthi et al., (2020) who said that limited infrastructure, lack of awareness, and inadequate regulatory frameworks hinder effective e-waste management in developing countries such as Ghana. Many countries lack the infrastructure needed for efficient e-waste recycling for example in Nigeria the absence of formal recycling facilities has resulted in the domination of unstructured informal sector activities, which often involve rudimentary and hazardous methods exacerbating environmental damage instead of reducing (Nnorom et al., 2021).

Similarly, in research carried out in Latin America, it was found that the limited availability of specialized recycling plants has negatively impacted the ability by the region to process e-waste

sustainably (Gutberlet et al., 2020). This study, therefore, benefited immensely from such findings in coming up with the business model.

In Southeast Asia, for instance, the lack of investment in state-of-the-art recycling facilities has limited the region's capacity to manage e-waste effectively (Manomaivibool et al., 2020). This financial barrier underscores the need for international cooperation and funding to support technology transfer and capacity building. As e-waste materials include a complex mix of materials, including metals, plastics, and hazardous substances, this makes recycling technically challenging. This is not limited to poor countries as in the United States, the difficulty of separating and recovering valuable materials from e-waste has been a significant barrier to achieving high recycling rates (Kahhat et al., 2021). Therefore, the complexity in material recovery due to the lack of technology to extract these materials increases the cost of recycling, making it less economically viable. The situation in Zimbabwe could be worse given that those involved in e-waste recycling are mainly unskilled and at informal scale.

#### **2.5.4 Informal Sector Involvement**

In many countries the informal sector plays the major role in e-waste recycling mainly in Global South as reported by Awasthi et al., (2021). The role being played by the informal sector cannot be downplayed but it is not a sustainable way of recycling e-waste as much of their activities often pose environmental and health risks as they are unsafe practices. Informal recycling practices, such as open burning and manual dismantling, expose workers and communities to hazardous substances. Amoyaw-Osei et al., (2021) found that in Ghana, the Agbogbloshie e-waste site has gained more popularity for its severe environmental and health impacts, including air pollution and soil pollution as well as the prevalence of respiratory illnesses among those operating in the informal recycling market.

Similarly, Awasthi et al., (2021) concluded that those same challenges have also been documented in countries such as India and Pakistan, where informal recyclers lack protective equipment and operate in unsafe conditions. Toxic substances such as lead, mercury and cadmium are released to the atmosphere through the e-waste recycling practices such as open burning and acid leaching,

and this poses severe risks to the health of workers and surrounding communities (Asante et al., 2022).

This is because many informal recyclers are marginalized and are exploited economically. Gutberlet et al., (2020) found that in Brazil, informal e-waste workers earn very low incomes and often have no access to social protections, perpetuating cycles of poverty and inequalities. Therefore, there is a need to bring together highly sophisticated formal recycling systems that are often highly financed with informal recycling systems that are underfunded which will greatly improve the working conditions and livelihoods of those in the informal e-waste management system. However, this is more complex than can be dealt with. Godfrey et al., (2021) found that in South Africa, efforts to formalize the e-waste sector have been hindered as there is great resistance from informal actors as they fear that they will lose their livelihoods, as well as the absence of incentives to formalize. Therefore, it is plausible to find whether there is a need for a multisectoral approach that balances both the economic, social, and environmental considerations to solve such challenges if they are found to exist at Magaba.

### **2.5.5 Economic Barriers**

High recycling costs, limited market demand for recycled materials, and insufficient funding are some of the barriers in the effective management of e-waste. Kahhat et al., (2021) say that United States the expense in the collection, transporting, and processing of e-waste has been a key factor in the low recycling rates observed in some states. Also, in the European Union, the cost of complying with stringent recycling standards has been the biggest financial constraint on both producers and recyclers of electronic devices (Eurostat, 2021). In addition, the lack of market demand for recycled materials can be seen as another major economic barrier. In China, despite the country's great investment in e-waste recycling infrastructure, there is a low demand for recycled plastics and metals which has limited the profitability of recycling operations (Wang et al., 2020). These findings point towards the need to come up with policies that create incentives towards the use of recycled materials in manufacturing.

In many developing countries, insufficient funding for e-waste management programs is a critical barrier for example in Nigeria, lack of financial resources has burdened the proper formulation of

formal recycling facilities and the implementation of awareness campaigns (Nnorom et al., 2021). Therefore, from such findings it can be seen that some initiatives such as the Basel Convention's technical assistance programs have a role to play in addressing funding challenges.

#### **2.5.6 Social and Cultural Barriers**

Behavioral factors that are influenced by social and cultural factors such as public awareness, and stakeholder engagement, have an effect on e-waste recycling outcomes. Research findings by Gutberlet et al., (2020) show that the low public awareness of e-waste issues is a significant barrier in many countries such as Brazil where a large proportion of the population is unaware of the environmental and health risks associated with improper e-waste disposal. It can be seen from these findings that there is need for targeted awareness campaigns to educate consumers about the importance of responsible e-waste management.

Consumer behavior, including the tendency to hoard old electronics and the preference for new products over repaired or refurbished ones, pose challenges for e-waste recycling. In Japan, for instance, the high rate of electronic device ownership and the cultural preference for new products have contributed to the accumulation of e-waste (Yoshida et al., 2021). Addressing these behavioral barriers requires interventions that promote a circular economic mindset. Effective e-waste management requires the active involvement of multiple stakeholders, including governments, producers, consumers, and recyclers. Strengthening stakeholder engagement through collaborative platforms and partnerships is essential for overcoming this challenge.

This critical review of the barriers being faced by many countries all over the world, both developed and developing in e-waste recycling are interrelated and multifaceted such as weak regulatory frameworks, technological insufficiency, economic incapacitation, social and cultural dimensions. There is a holistic approach that is needed in order to address the barriers analyzed above. The approach integrates policy reforms, technological innovation, stakeholder collaboration, and public awareness campaigns. By learning from the experiences of other countries, the researcher has developed a more effective and sustainable e-waste management system that balances environmental protection, social equity, and economic growth.

## 2.6 Conceptual Framework

A conceptual framework is defined by Creswell (2018) as a model that connects two or more variables in the research. In this research, the conceptual framework creates a relationship between three major variables which are the sustainable business model, e-waste recycling, and small-scale retailers. The proposed conceptual framework the three sectors of sustainable business practices, e-waste recycling, and small-scale retailers to come up with a circular economy. Therefore, the model has three key components which are Sustainable business model, e-waste recycling, and small-scale retailers. Fig 2.1 presented below is the conceptual framework for this research showing the connection between the variables in the model.

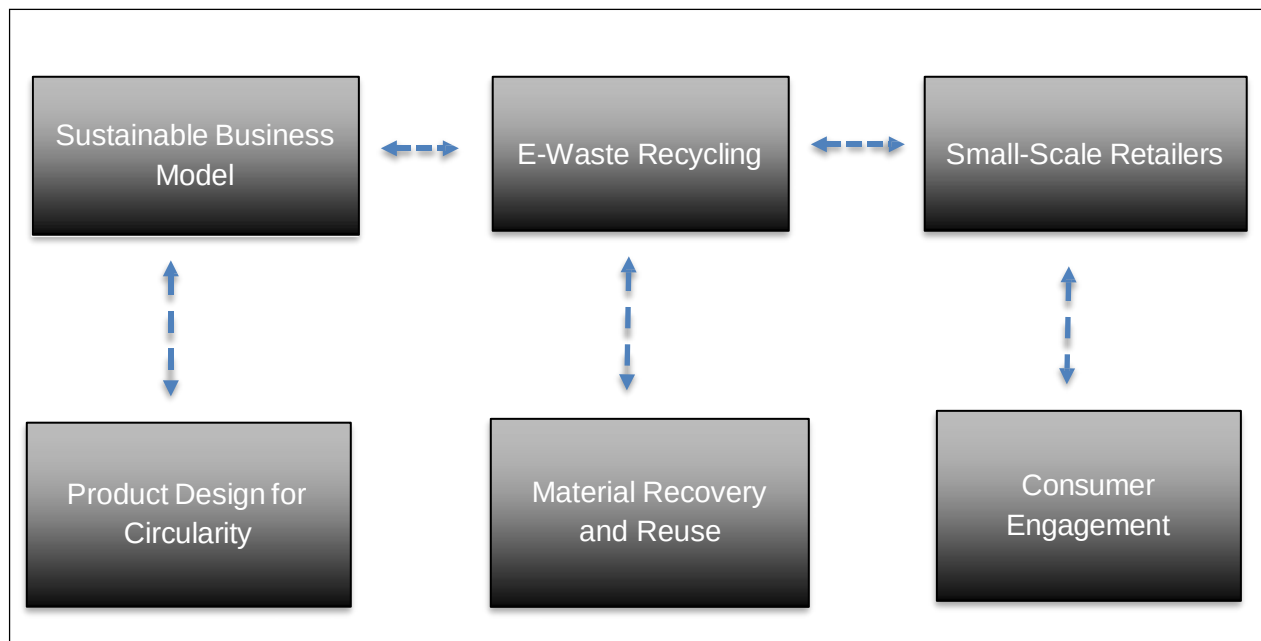


Figure 1. 2 A model for E-Waste Recycling in a Circular Economy

**Source: Adapted from Arya and Kumar 2021**

The framework in fig 2.1 focuses on creating circularity in electronic waste management with the idea of enforcing recycling and reusing with stakeholders getting incentives to participate in the model. In the proposed model, there is a collaboration between e-waste recyclers, retailers and consumers that enables e-waste to be reused and recycled. Recyclers recover materials that can be fed back into the production system which helps to reduce the reliance on new resources in the production of other gadgets. Collection points will be established where consumers can deposit

gadgets, they no longer need, and these will directly be the responsibility of small-scale retailers at Magaba making them to be centers of e-waste management.

The output for the model is the creation of a closed-loop system whereby retailers at Magaba environmental footprints encourage sustainable use of resources. Therefore, electronic waste is responsibly managed, leading to a reduction in pollution and the recovery of valuable materials used in making these electronic gadgets. In this new system, small scale retailers at Magaba benefit economically and at the same time contributing to sustainability, and consumers are empowered to make eco-friendly choices. The model fosters a circular economy, which drives environmental, social, and economic benefits for all stakeholders providing a sustainable ecosystem.

## **2.6.1 Variables in the Conceptual Framework**

### **2.6.1.1 Sustainable Business Model**

A sustainable business model is defined as a system that incorporates sustainability principles into the value proposition, value creation, delivery, and capture mechanisms of a business making sure that the three pillars of economic, environmental, and social are addressed in a way that is balanced to all users (Bocken et al., 2019). The foundation for this conceptual framework is the business model which emphasizes environmental responsibility as well as social responsibility and at the same time incorporating profitability. The proposed model focuses on creating products that have a longer life cycle that incorporates the recyclability element which positively impact the environment through reduced generation of e-waste (Wang et al., 2020). The term sustainability was incorporated in the model as it aimed at serving the environment through reducing generations of new waste through using already made products that can be recycled.

This reduces environmental footprints for all involved from manufacturers to consumers. This aspect comes into this model as small-scale retailers at Magaba collaborate with e-waste recyclers to collect materials from waste that can now be fed back into the production system. For many small-scale retailers at Magaba, this can be an added business as they can sell recovered materials to manufacturers as well as become more marketable in the future if awareness campaigns created environmentally conscious consumers who would prefer environmentally friendly gadgets. In the

model, small-scale retailers at Magaba distribute sustainable products and educate consumers, further embedding sustainability into the value chain. The interconnectedness of the sustainable business model with e-waste recycling and small-scale retailers ensures a closed-loop system, where resources are continuously reused, and waste is minimized.

#### **2.6.1.2 E-Waste Recycling**

In defining e-waste recycling, Forti et al., (2020) say that it is the systematic process of collecting, sorting, and processing end-of-life electronic products to recover valuable materials and ensure the safe disposal of hazardous components, thereby reducing environmental pollution and promoting resource efficiency. In the model, this forms a critical component of the conceptual framework helping to address the environmental hazards posed by the unsafe disposal of electronic waste. In this model, recyclers work closely with retailers to recover valuable materials like metals and plastics, which are then passed back to producers and are fed back into the production process. This reduces the need to continuously rely on finite resources which helps to lower the carbon footprint in the manufacturing of electronic products (Abalansa, et al., 2021).

Recyclers create an incentive system for retailers and consumers by giving discounts or cashback schemes helping in fostering greater engagement (Asefi, et al., 2019). In this model, there is an interconnectedness between recyclers and retailers with the latter ensuring that electronic gadgets are managed in a responsible manner at the end of their lifecycle, contributing to a circular economy.

#### **2.6.1.3 Small-Scale Retailers**

Small-scale retailers are business enterprises that operate on a modest scale, typically with smaller space they occupy, lower revenue, and the customer base is not large, usually locals and often emphasize offering personalized service and having a higher community engagement (OECD, 2020). In this model small-scale retailers are the bridge between consumers and sustainable practices, which makes the framework more accessible and practical as well (Asefi, et al., 2019). In the model, retailers collaborate with businesses (distributors) to promote and sell eco-friendly products, creating demand for sustainable goods. They also serve as collection hubs for e-waste, enabling consumers to return used electronics conveniently. This role is supported by incentives

from recyclers, ensuring active participation. Retailers educate consumers on the importance of recycling and sustainable consumption of electronic goods which fosters a change of behavior amongst consumers (Maphosa & Maphosa, 2022). The relationship between small-scale retailers with the business model and e-waste recycling ensures that sustainability is integrated into everyday consumer practices. This drives the adoption of circular economy principles at the lowest level in the chain.

## **2.7 Chapter Summary**

The chapter presented literature reviews necessary in creating a clear understanding of the current topic. Theoretical framework was presented and is based on three major theories which include The Sustainable Theory, Stakeholder Theory, and Entrepreneurial Business Model Innovation to guide the development of a sustainable business model. The conceptual framework was presented as well as empirical research analysis and the research gap. It was concluded that the development of a sustainable business model for e-waste recycling is a necessary solution for the problem identified in Chapter One. The following chapter presents the methodological and scientific approaches used in the study.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

Chapter three presents the methodological and scientific approach to the study which is the method that was adopted in carrying out this research in developing a sustainable business model for e-waste recycling in Magaba. This research methodology outlines a qualitative approach adopted in the development of the business model. The methodology used qualitative research methods to ensure a comprehensive understanding of the problem and the development of practical solutions. Research paradigm, research approach, design and data collection and analysis are presented in this chapter.

#### **3.2 Research Paradigm**

A Paradigm in research can be said to be a viewpoint concerning how the research should be carried out. This can be said to be methods that should be utilized to collect and analyze data on the chosen topic and how it is applied and apply data regarding a topic. According to Saunders, Lewis, and Thornhill (2019), a research study's guiding principles are known as its research philosophy. The research philosophies of positivism, interpretivist, and pragmatism are among the many that exist.

##### **3.2.1 Interpretivist**

The interpretivist paradigm assumes that the sample data used is adequate to develop a theory that can be generalized to the whole population and the outcome is that there is inductive reasoning coming from particular to general (Etikan et al., 2016). The interpretivist philosophy assumes that reality is subjective and therefore differs with an individual perception of phenomena. As a result, subjective methods were found to be more appropriate. In carrying out this research, an interpretivist research paradigm was chosen. In the context of studying e-waste recycling in Magaba, a bustling informal market, interpretivist offered a powerful lens to understand the motivations, beliefs, cultural practices, and socio-economic conditions of small-scale retailers,

recyclers, and residents involved in e-waste activities. Magaba's e-waste ecosystem involves informal actors, complex behaviors, and unregulated networks.

Interpretivist allowed the researchers to delve into the why behind practices of informal collection, repair, and disposal of e-waste, offering insights into local knowledge, challenges, risks, and motivations (Saunders, et al., 2019). However, the researcher was aware of the disadvantage that interpretivist research could inherently be subjective. The researcher's own views could have influenced data interpretation, especially in politically or socially sensitive environments like Magaba. In order to avoid researcher bias and censorship of responses from participants, the researcher ran the interview guide with experts in qualitative research in order to ascertain any bias that could emerge from the data collection instrument. The researcher also ensured that all responses were confidential and their names will not be published in the thesis for privacy reasons.

### **3.3 Research Approach**

A research approach refers to the overarching strategies used to conduct research, encompassing the methods and techniques employed to collect and analyze data (Creswell and Creswell, 2018). There are mainly three primary research approaches which are quantitative, qualitative, and mixed methods.

#### **3.3.1 Qualitative Research Approach**

Qualitative approach to research on the other hand puts much emphasis on creating a deeper understanding of the phenomena under study using methods that are non-numerical such as by observing the variables in their natural settings (Creswell and Creswell, 2018). The approach was found to be most appropriate because the research was carried out in Magaba, an informal settlement, faces multifaceted challenges related to e-waste management, including environmental degradation, health hazards, and economic inefficiencies. Studies by Awasthi et al. (2021) used quantitative research approach to estimate e-waste volumes and evaluate the efficiency of recycling processes. However, quantitative data cannot fully capture the social and cultural dynamics of e-waste management in informal settlements like Magaba.

Qualitative research approach enabled the researcher to explore the actual experiences of informal recyclers, what motivated them and the likely challenges they were facing. The researcher

followed the approach that was used by Oteng-Ababio et al. (2020) as it provided insights critical for designing inclusive and contextually relevant business model which was the aim of this study. By using the qualitative approach, the researcher managed to address the complexity of e-waste recycling in Magaba. The qualitative data revealed whether there were incentives encouraging them to participate in such sustainable exercises.

One main advantage of the qualitative research approach was its ability to bring out feelings and opinions of participants, making it possible to have a clear understanding of the conditions that people involved in e-waste activities at Magaba were going through. This enabled the researcher to come up with a working model that could address various socio-economic concerns. This could not have been achieved if quantitative approach was used. However, the researcher noted that one disadvantage of this approach was the aspect of researcher bias. When gathering information using this research approach, the possibility of bias on interpretation was likely to be very high.

### **3.4 Research Design**

A research design is the structure that guides the process of collecting, analyzing, and interpretation of gathered data in answering formulated research questions (Saunders et al, 2019). This therefore can be seen as a blueprint in the research as it ensures that the research is systematic and is aligned with outlined research objectives. There are many types of research redesign that the researcher could have chosen including exploratory, descriptive, explanatory, case study and experimental, each suited to different research goals and contexts (Creswell and Creswell, 2018). Morgan, (2020) alludes that in mixed methods research, designs can be classified as convergent, explanatory sequential, or exploratory sequential, depending on the order and priority of qualitative and quantitative components. This description of a research design focuses on appropriate research data management and incorporates a number of elements, tactics, and procedures for gathering and analyzing data (Bell, 2021).

When attempting to establish a cause-and-effect link in a circumstance or event, an experimental study design is used (Rieger, 2019). It is a kind of causal research design where the researcher tries to see how a variable affects a dependent variable. In doing so, the researcher uses experimental models to try to determine or forecast what might happen (Raimond, 2016). Due to its

shortcomings in terms of being quantitative and objective and the need to manipulate some factors that the current research could not support experimental research design was deemed inappropriate for the current study. On the other hand, establishing a link between two variables is the goal of correlational study design. Correlational research seeks to identify relationships and similarities between variables, whereas experimental research seeks to monitor changes between variables (causal) (Sassower, 2017). It is a non-experimental method that depends on statistical analysis to determine how these factors relate to one another. The design is quantitative and therefore could not be used for this mixed methods study.

### **3.4.1 Case Study**

In the current study, the researcher chose a case study as the appropriate research design that fits well with the chosen philosophy of interpretivism and the qualitative research approach. A case study research design is a qualitative approach used to explore a phenomenon in-depth within its real-life context (Yin, 2018). It involves detailed examinations of a single case or multiple cases over time, using various data sources such as interviews, observations, documents, and reports (Morgan, 2020). A case study design allows the researcher to focus specifically on the practices, challenges, and systems of small-scale retailers and informal collectors. The researcher chose this design because it helped to capture the complex social, economic, and environmental dynamics of recycling activities within that specific setting. Finding the exact causes and contributing factors that account for the unit's entire behavioral patterns and its position within the surrounding social milieu is the goal of the case study (Yin, 2018).

Creswell and Creswell, (2018) added that all the facets of a single entity are covered by the case study technique, which typically studies the subject matter qualitatively. Yin, (2018) emphasizes that case studies are ideal when the boundaries between the phenomenon and context are not clearly evident, and when, how or why questions are being asked. Creswell, (2013) adds that a case study is suitable for exploring unique or emerging processes. It is in this regard that the case study design was very valuable for generating rich, contextual insights into real-world issues like sustainable e-waste recycling. However, a major disadvantage of this research design is its inability to produce results that can be generalized to a greater population as the small area studied may have specific characteristics that do not exist in outside areas.

### **3.5 Population**

The research target population refers to the entire group or set of individuals, objects, or events that possess specific characteristics and are of interest to the researcher (Thomas, 2023). A population is a cornerstone in research methodology, encapsulating a collective of individuals who exhibit shared characteristics within a defined geographic or institutional domain (Martínez-Mesa et al., 2016). Target population is defined based on the research objectives and the specific parameters or attributes under investigation. By identifying the target population, researchers can refine their research objectives and sampling strategies to ensure alignment with the study's aims and objectives (Alvi, 2016). Therefore, in the current research, the target population comprised of small-scale retailers who are involved in the selling of electronic gadgets at Magaba, and informal recyclers who collect electronic waste materials from Magaba. This group of stakeholders were found by the researcher to be more involved in the topic under study, and their opinions were of more importance.

### **3.6 Sampling**

Sampling is a statistical process that involves selecting a representative subset of individuals from the whole population but representing the whole population (Creswell and Creswell, 2018). In every research, sampling is done in order to allow researchers to make valid conclusions and generalizations about the whole population. There are mainly two sampling methods that researchers can choose from that is probability sampling and non-probability sampling. In the current research, non-probability sampling methods were adopted. Therefore, purposive sampling techniques were used in selecting the representative sample. Probability sampling was not chosen due to the nature of the research and the desired outcomes of the research.

#### **3.6.1 Purposive Sampling**

Qualitative research requires the use of non-probability methods in sample selection (Morgan, 2020). Non-probability sampling does not involve random selection and is often used in qualitative research or when the population is difficult to access (Awasthi et al., 2021). Common techniques include purposive sampling where participants are selected based on specific characteristics or expertise relevant to the research, snowball sampling where the existing participants refer to others who meet the study criteria, convenience sampling whereby participants are selected based on their

availability and willingness to participate. Therefore, in this study, purposive sampling was found to be useful for identifying key stakeholders, such as informal recyclers, community leaders, and local retail owners, who have firsthand experience with e-waste management.

The main advantage of this method in this research was that only people involved in e-waste activities were identified, reducing the possibility of having a large number of people with less information required in the research. However, the sampling strategy does not come without a disadvantage. The major disadvantage was of bias as some important potential participants with more knowledge about e-waste could have been left out. This shows research bias and could potentially lead to poor findings.

### **3.6.2 Snow Balling**

Snowball sampling is a non-probability sampling technique commonly used in qualitative research, especially when investigating hard-to-reach or specialized populations (Noy, 2021). Snowball sampling was employed to reach hidden or hard-to-access populations, such as informal recyclers who operate outside formal systems (Saunders et al., 2013). The researcher found snowballing to be effective due to the informal and fragmented nature of the e-waste ecosystem involving small-scale retailers, and informal collectors. In this method, the researcher began by identifying a few participants who met the criteria of the study, such as informal e-waste collectors or small electronics retailers. These initial participants were then asked to refer to other individuals they know who were also involved in e-waste activities. This chain-referral process continued until the desired sample size was achieved or data saturation is reached (Noy, 2021).

This method was beneficial in Magaba, where the e-waste actors often operate informally, without registration or public listings. These individuals might have been hesitant to participate in formal research unless referred to by trusted peers. This sampling technique helped the researcher penetrate social networks, build trust, and access diverse perspectives from key informants embedded in the Magaba informal market (Soy, 2021). According to Etikan, Alkassim, and Abubakar (2016), snowball sampling is ideal when studying hidden populations and ensures deeper insights, especially when participants are not easily identifiable through conventional

sampling frames. However, the disadvantage is that the method might have introduced bias, as participants tend to refer individuals with similar characteristics or experiences.

### **3.6.3 Sample Frame**

A sample frame is a list or representation of all the individuals, groups, or units in a population from which a sample is drawn (Oteng-Ababio et al., 2020). It serves as the foundation for selecting participants and ensures that the sample is representative of the population. Obtaining an accurate and comprehensive sample frame is crucial for the validity and reliability of research findings (Morgan, 2020). In carrying out this study in Magaba, formal records were incomplete or outdated, preliminary fieldwork was necessary to build a sample frame. The researcher mapped the area identifying local players that generate e-waste, and waste collection points where e-waste activities were concentrated. It was necessary to use snowballing by asking initial participants to refer others who met the study criteria, which helped in expanding the sample frame. Therefore, in this study, the sample frame included informal recyclers who were observed through preresearch carrying out their activities at the dump site and areas around the informal market. Small-scale retailers involved in electronic consumption such as cellphone dealers, radios and other electronic devices were compiled from field visits to the market area.

### **3.6.4 Sample Size**

In order to select a representative sample, the researcher used guideline from Lal, (2025) who ascertained that for indepth interviews, the sample can range between twelve (10) - fifteen (15) participants, and for focus group discussions, there can be four (4) to six (6) groups with each group having five (5) - ten (10) members each. Therefore, from this realization, the research sample was 30 participants. The sample for the research was divided into two groups, one for in-depth interviews with ten (10) participants from small-scale retailers and another for focus groups with four (4) groups and each group had five (5) members. The group for focus groups were the informal e-waste collectors.

Table 3. 1 Research Sample

| <b>Strata</b>               | <b>Criteria</b>         | <b>Population</b> | <b>Sample Size</b> |
|-----------------------------|-------------------------|-------------------|--------------------|
| Small scale retailers       | In-depth Interviews     | 20                | 10                 |
| Informal e-waste collectors | Focus group discussions | 50                | 20                 |
| <b>Total</b>                |                         | <b>70</b>         | <b>30</b>          |

Source: Researcher's Computations

As this was qualitative research, the researcher purposively selected thirty (30) participants from an estimate of 70 including informal e-waste recyclers and small-scale retailers dotted around Magaba informal market. The researcher noted from other researchers such as Etikan et al., (2016), Bhattacharya, (2021) and Guest et al., (2020) that selecting a small sample such as 30 in qualitative research brings depth of insights to be shared. This shows that a smaller group enables the researcher to gather data through intensive in-depth interviews or focus group interviews allowing for maximum engagement, and the researcher can be able to explore complex experiences, meanings, and perspectives more thoroughly. Bhattacharya, (2021) added that such a small sample can lead to richer, more nuanced data, which was central to the goals of the current research on e-waste management as questions on the why and how behind behaviors and experiences, rather than generalizing to a larger population were answered.

### 3.7 Data Collection

Data collection tools refer to instruments and methods that researchers use in gathering data in answering research questions or research hypotheses outlined based on research objectives (Creswell & Creswell, 2018). Data collection tools used in this research were influenced by the pragmatism research philosophy, the exploratory sequential research design, mixed methods research approach and the type of data that was being gathered. In these mixed methods research, the researcher used qualitative approach which influenced the choice of in-depth interviews, focused group discussions. This choice was influenced by the need to have a comprehensive understanding of e-waste recycling at Magaba.

### **3.7.1 Qualitative Data Collection Tools**

#### **3.7.1.1 In-Depth Interviews**

In-depth interviews are defined by Bryman and Bell, (2022) as personalized interaction between the researcher and the respondent whereby there is an interactive session of soliciting the personal views, experiences and opinions of the respondent. Therefore, in the current study, the researcher used this tool in gathering qualitative data in order to explore the experiences, motivations, and challenges of key stakeholders involved in e-waste recycling. The interviews were carried out with informal recyclers, and small-scale retailers at Magaba informal market. A semi-structured interview guide was used, which the researcher found to be flexible in probing deeper into the responses coming from the participants whilst at the same time ensuring consistency across participants.

The researcher prepared an interview guide (See Appendix 1) with open-ended questions covering questions probing the current e-waste recycling practices, economic and social challenges, perceptions of sustainability and potential solutions. The researcher used this instrument as its other researchers such as Maphosa and Maphosa, (2022) found it to be rich, and brings detailed insights as well as allowing for exploration of complex issues. The main disadvantage of in-depth interviews as noted by other researchers who used them such as Saunders et al., (2021) was that it was time-consuming and required skilled interviewers to ensure quality data. Balancing the potential bias of information gathered and directing the respondent towards the research goals was found to be difficult.

#### **3.7.1.2 Focus Group Discussions (FGDs)**

The researcher carried out four focus group discussions at the Mbare Hall in Magaba. Each group comprised of 5 members from informal recyclers who welled in Magaba. The researcher used a topic guide to ensure all key themes were covered. The problem of electronic waste management has a wider reach and involves almost every member of society, not only small-scale retailers (Oteng-Ababio et al., 2020). Therefore, in pursuit of getting adequate information needed in coming up with the business model, the researcher used focus group discussions to gather collective perspectives and foster discussion among stakeholders. In order to foster interactions

amongst group members, the researcher used a discussion guide with prompts. The main advantage was that FGDs generate diverse viewpoints and highlight areas of consensus or disagreement (Bryman and Bell, 2022). However, the researcher was aware of some disadvantages that this data collection method could bring such as that group dynamics could influence individual responses, and dominant participants may have overshadowed others.

### **3.8 Data Collection Procedures**

The researcher started by getting a letter of approval from the university which was used to get permission from the local authorities. The researcher did this to confirm that the research was purely for academic purposes, confirming the ethical issues that existed in the research. After obtaining the university letter, the researcher approached the Harare Council Secretariat through email and was given approval in writing. The researcher therefore went on to identify participants. The researcher identified the group for in-depth interviews considering their age and experience in the sector as well as their level of skills and knowledge. For each of the 10 interviewees, 15 minutes were allocated and permission to carry out recording was asked before the interview. These interviews were held at their places of work at Magaba. After all the interviews were done, the researcher went on to do focus group discussions. For each of the four focus group discussions, an hour was allocated. Timing for the discussions was during lunch hour from 1 pm to 2 pm. This allowed the researcher to get maximum participation. These discussions were held at a rented electronic repair shop at Magaba to avoid travelling costs for participants. There was no recording done during these discussions.

### **3.9 Data Analysis**

Thematic analysis was chosen as the suitable data analysis tool as the research was qualitative research. This was done to ensure a comprehensive understanding of the problem and the development of practical solutions (Maher et al., 2018). Qualitative data analysis focuses on interpreting non-numerical data to identify patterns, themes, and insights. The researcher used a thematic analysis in order to identify and analyze recurring themes and patterns in qualitative data, such as interview transcripts and focus group discussions (FGDs). Narrative analysis was done in analyzing stories and accounts shared by participants during interviews and FGDs to understand their experiences, perspectives, and motivations.

### **3.10 Ethical Considerations**

Ethical considerations in research are crucial to ensure the integrity, validity, and moral responsibility of the study (Bhatt Acharya, 2020). In carrying out this research, the following ethical issues were observed:

#### **3.10.1 Informed Consent**

Informed consent is a fundamental ethical principle in research, ensuring that participants are fully aware of the study's purpose, procedures, risks, and benefits before agreeing to participate (Bhattacharya, 2021). This respects participants' autonomy and the right to make informed decisions. To ensure informed consent, there was a consent form on the questionnaire and on FDGs and in-depth interviews, the researcher began by getting consent.

#### **3.10.2 Confidentiality and Anonymity**

Protecting participants' identities and personal information is essential to maintain trust and prevent harm. Researchers must ensure that data is stored securely and that participants cannot be identified in published results (Smith and Jones, 2020). The researcher specified that respondents don't share their names during the data collection period.

#### **3.10.3 Avoidance of Harm (Non-Maleficence)**

Researchers must ensure that their studies do not cause physical, psychological, or social harm to participants (Johnson and Lee, 2019). This includes minimizing risks and providing support if harm occurs. The researcher ensured that all the data gathering instruments went through editing by other researchers in order to detect anything that could cause harm.

### **3.11 Truthfulness and Trustworthiness**

In qualitative research, truthfulness and trustworthiness are essential in ensuring that the study accurately represents participants' experiences, perspectives, and the context being investigated. These concepts affirm the credibility and ethical integrity of the research process and findings.

### **3.11.1 Truthfulness**

Truthfulness refers to the authenticity and honesty of the data and the interpretations made by the researcher. It emphasizes that the voices, experiences, and realities of the participants are represented as they are, without distortion or bias (Nowell et al., 2017). In qualitative research, truth is often seen as subjective, shaped by context and perspective. Therefore, instead of seeking a single objective truth, researchers aim for coherence and resonance with participants' experiences (Maher et al., 2018). Therefore, the researcher ensured Truthfulness in the current research through maintaining reflexivity by being aware of self-bias and member checking through allowing participants to review and confirm the findings. The researcher also ensured that there were thick descriptions which ensured that there was detailed context to make interpretations more meaningful.

### **3.11.2 Trustworthiness**

Trustworthiness, according to Lincoln and Guba, (2018) framework, is the overarching standard for evaluating qualitative research. It includes four key components: credibility, transferability, dependability, and confirmability. Credibility means confidence in the truth of the findings. This was achieved through prolonged engagement, triangulation, and member checks (Korstjens & Moser, 2018). Transferability, which refers to the extent to which findings apply to other contexts, was achieved through thick description. Confirmability refers to the neutrality of findings; by ensuring they are shaped by participants, not researcher bias. This was achieved through auditing and reflexivity.

## **3.12 Chapter Summary**

The chapter presented a review of methodological and scientific approaches that were used in the study. The researcher used a pragmatic research philosophy which shaped the mixed methods approach and the exploratory sequential design. The chapter presented data collection tools whereby qualitative data was collected using interviews and observations. Data analysis tools were outlined where qualitative data was analyzed using thematic analysis and content analysis. The chapter also presented the ethical issues that were observed in carrying out this research, as well as how trustworthiness and truthfulness were ensured.

## **CHAPTER FOUR**

### **DATA PRESENTATION AND ANALYSIS**

#### **4.1 Introduction**

This chapter presents the findings of qualitative study. The study sought to explore the current e-waste management practices among small-scale electronic retailers in Magaba, assess the barriers to effective e-waste recycling at Magaba, and ultimately propose a workable model tailored to their socio-economic context. Data for the study was collected through in-depth interviews and focus group discussions involving small-scale electronic retailers and informal collectors. Thematic analysis was used to interpret and organize the data into coherent themes aligned with the study's research objectives. This approach enabled the researcher to understand participants lived experiences, challenges, and suggestions regarding e-waste handling and recycling.

#### **4.2 Research Objectives**

The research was carried out with three objectives intended to be achieved. The research objectives gave direction to the methodologies used to answer research questions with the aim of achieving these objectives. The following were research objectives presented in the first chapter:

- To assess the current state of e-waste management among Magaba's small-scale retailers.
- To examine barriers to effective e-waste recycling in Magaba.
- To design a working model for e-waste management tailored to the needs of the small-scale retail sector at Magaba.

The first two research objectives were structured to feed important variables and connections in the model that was developed and which was the third objective.

#### **4.3 Demographic Representation of Participants**

There was a total of 30 participants drawn from the informal e-waste sector operating within Magaba informal market in Mbare. The participants consisted of 20 informal e-waste collectors and 10 small-scale retailers dealing with electronic gadgets. The researcher used purposive and snowball sampling methods to find participants who are much exposed to e-waste and disposal of

electronic goods. The researcher categorized participants according to their different demographic characteristics in order to find out whether their insights on e-waste were influenced by these demographic characteristics. These demographic factors included age, gender, education and experience. They are analysed in detail in the following section starting with age representation.

#### 4.3.1 Age

During interviews and focus groups, the researcher carried out age analysis. The 30 participants were grouped into two categories: 20 informal e-waste collectors and 10 small-scale electronics retailers. Their ages ranged between 18 and 60 years, which highlights the diversity in experience, physical capacity, and role differentiation within the e-waste sector in Magaba. Figure 4.1 below presents the information.

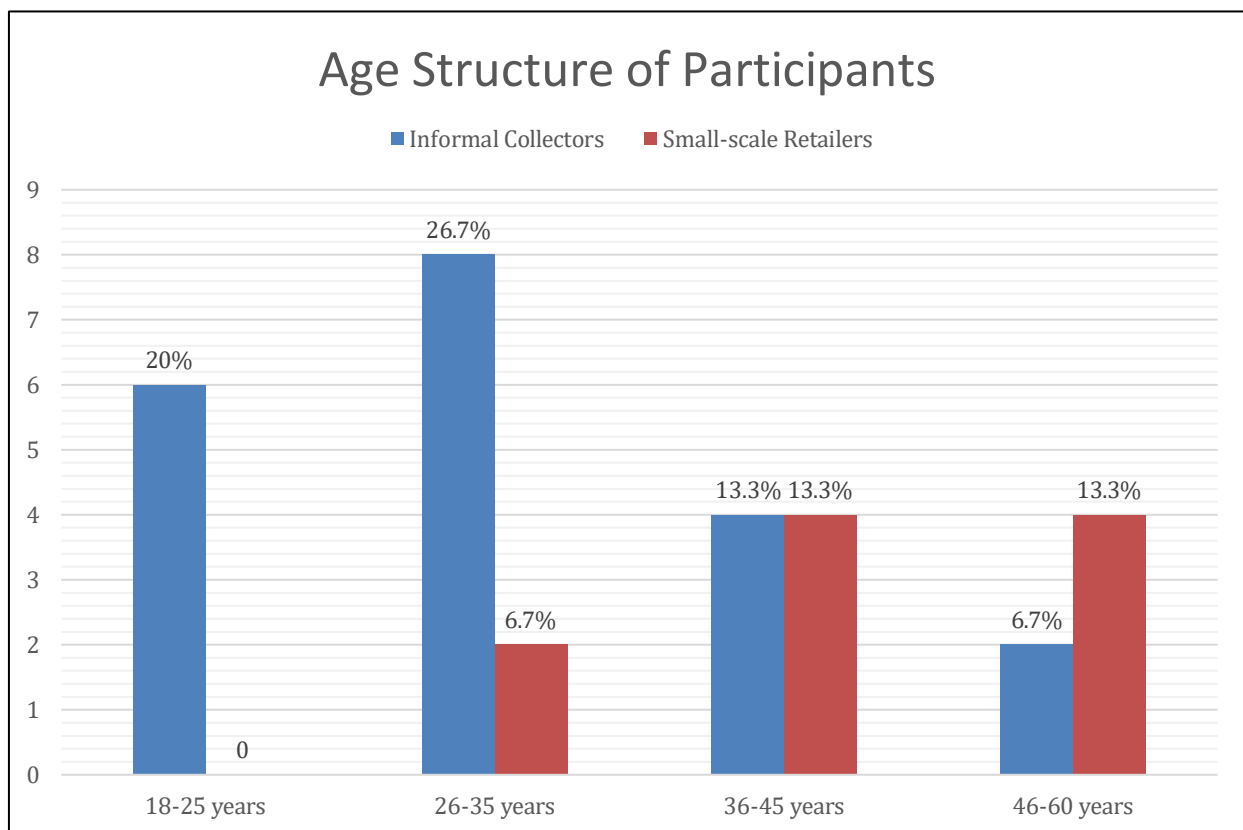


Figure 4. 1Age Structure of Participants

Source: Research Data

This age group, from 18 to 25 years, was entirely made up of informal e-waste collectors with 6 participants indicating 20 percent of the total participants. This distribution indicates the rising unemployment and economic hardships faced by youth in urban areas. Individuals in this category could be forced to enter this trade due to the absence of desired jobs because of high unemployment in urban areas such as Harare. As indicated by their category of being informal collectors, their major roles involve collection of e-waste and dismantling discarded electronic gadgets and mainly they do not have technical skills. The age group ranging from 26 years to 35 years were the most participants.

There were 10 participants in this age range indicating participation rate of 33 percent. Of this 33 percent, informal collectors constituted 27 percent and retailers only 6 percent. This indicates a transition from informal collectors to small-scale retailing. These findings indicated that the age group was the most active and most productive according to the statistics presented. These individuals showed slightly more knowledge and involvement in small-scale repair, resale, and value recovery. Many expressed a desire to formalize their work but lacked capital and training.

At the age range of 36 to 45, participation was equal for informal collectors and small-scale retailers. There were 8 participants representing 27 percent of the total number of participants. The age group had a balanced number of participants as these were more experienced and had a better understanding of electronics recycling and customer preferences. Findings seem to suggest that roles were structured with some creating networks with suppliers of e-waste and buyers in various areas. The age group of 46 to 60 years was mainly dominated by small-scale retailers. The findings seem to suggest that by being in the field for a long period, people tend to build strong networks, customer trust and develop skills and knowledge in handling e-waste.

From these findings on age representation of participants, it can be noted that young people dominate the side of e-waste management which is more labour intensive and mostly operates at subsistence level. Findings show that many older participants in e-waste value chain are business oriented with more focus on resale, repairs and sometimes up cycling. Some key insights from this age analysis indicate that the age group of 26 to 45 shows that they are more suitable for targeted intervention as they indicate balance of energy and great willingness to improve. Age analysis

points towards the conclusion that there is a possibility of training programs that can be tailored to support the youthful energy and experience on older participants.

#### 4.3.2 Gender

The researcher carried out analysis on gender participation in the research. Findings indicate that from the 30 participants in the research, 22 were males and 8 were females. These findings show a gender imbalance which reflects the broader gendered nature of informal labour markets in many informal markets such as Magaba. The findings seem to suggest that the sector is perceived as demanding physically and technically. Results are resented in the following figure 4.2.

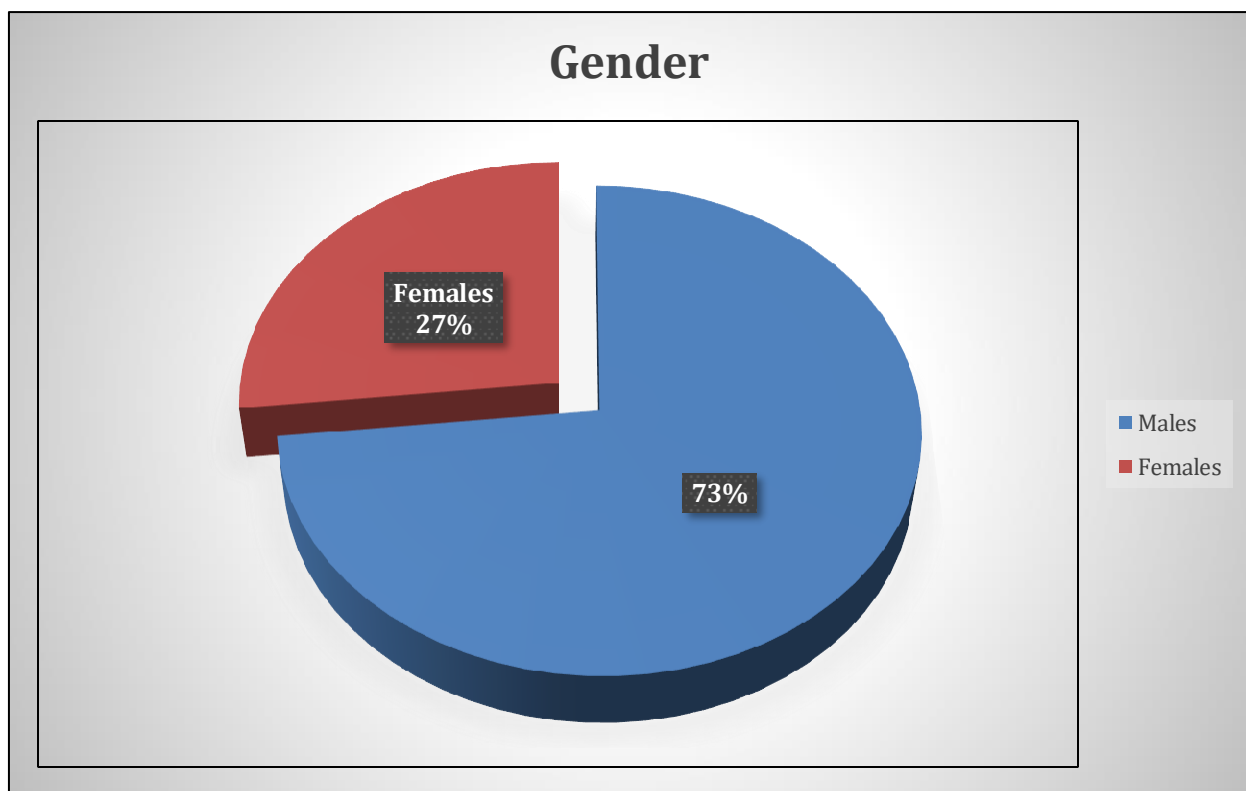


Figure 4. 2 Gender Participation rate

**Source: Research Data**

Findings presented in figure 4.2 indicates a male dominance in the informal collector group with 17 out of 20 participants which showed male dominance of up to 85 percent. This can be attributed to the physically intensive nature of collecting, dismantling, and transporting electronic waste tasks

that are typically associated with male labour in Zimbabwe's informal economy. Findings indicated that among small-scale retailers, male participants (5) were often more established, with small repair stalls or electronics resale shops. On the other hand, there were only 3 involved in e-waste collection, with findings indicating that they were often involved in collecting smaller gadgets such as disused computer accessories, chargers, and old phones. Indications from participants showed that lack of protective gear and physical strength as barriers to engaging fully in collecting e-waste.

However, of interest was the strong representation of women in the small-scale retail category where 5 out of 10 were females indicating 50 percent representation. The findings suggest that women in the retail sector worked from market stalls, combining e-waste reselling with other informal trade such as mobile accessories and electrical components. From the findings, women in the retail sector showed a strong interpersonal skill set, community trust, and business acumen, which shows that they have great potential in the sustainable e-waste management system.

#### **4.3.3 Education**

Understanding the educational levels of participants provides insight into their capacity to engage with sustainable e-waste management practices, adapt to innovations, and understand health, safety, and environmental concerns related to e-waste handling.

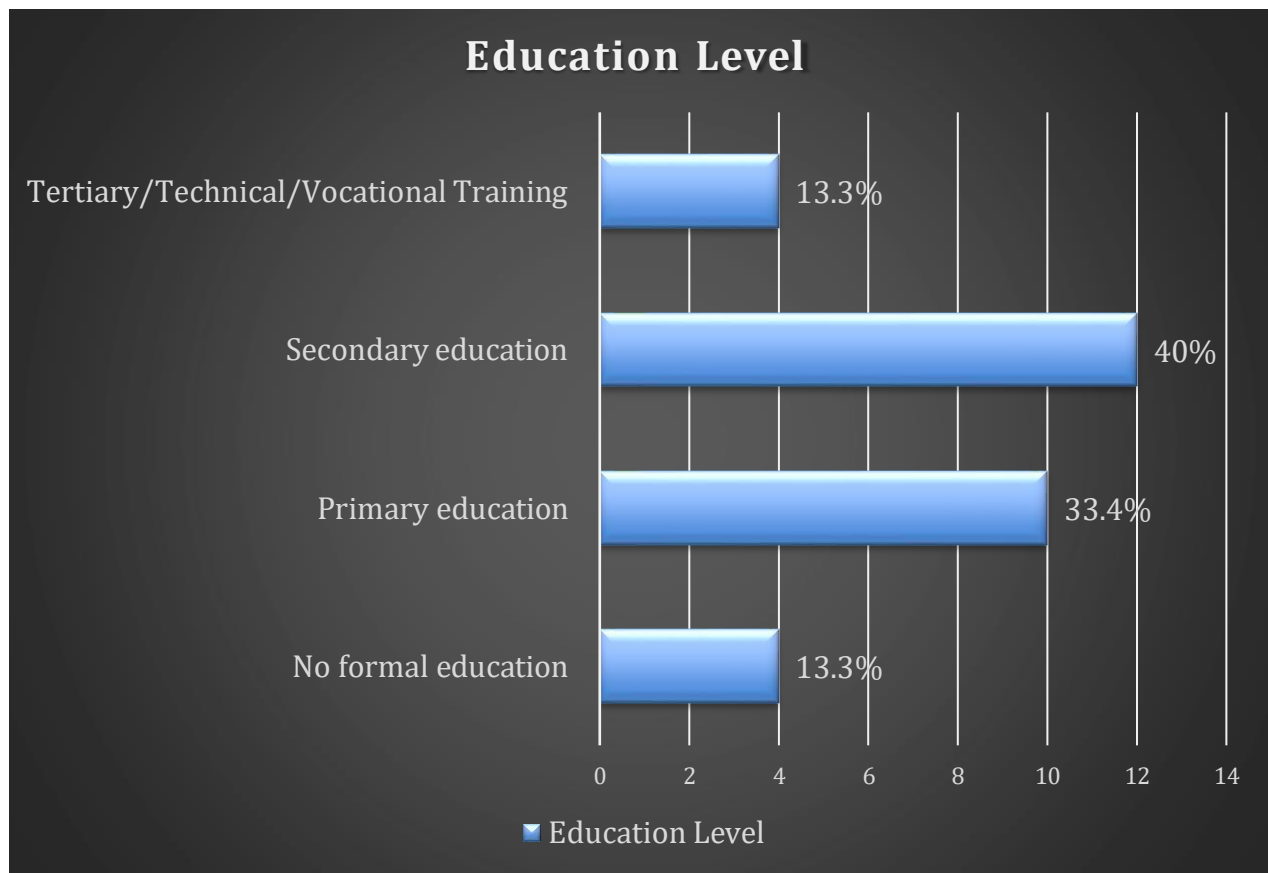


Figure 4. 3 Educational Level of Participants

**Source: Research Data**

Findings indicate that 8 out of 20 informal e-waste collectors had only primary education which shows that 40 percent of informal e-waste collectors had very low levels of education. The same findings showed that 6 informal e-waste collectors had secondary education with some up to O-level, but with no formal qualifications. It was also found that 4 of informal e-waste collectors did not have formal schooling and had gained skills in dismantling electronics through peer learning. However, only 2 informal e-waste collectors had technical training, mainly in basic electronics or welding.

Findings indicated that from the 10 participants from the small-scale retail category, 6 participants completed secondary education, 60 percent. Only 2 indicated that they had received vocational or technical training, such as mobile phone repair or electrical appliance maintenance, and the remaining 2 had only primary education, relying on business experience more than formal

education. From these findings, it can be seen that the low levels of formal education among informal e-waste collectors reflect the socio-economic marginalization that is found in informal urban employment. Learning basic life skills such as sorting e-waste comes from practical, observations and peer learning. Also, education representation from small-scale retailers shows that education may correlate with their ability to manage small businesses. It can be seen from these results that technical knowledge in sorting e-waste was mostly informal with many participants indicated having acquired skills through informal mentorship, particularly in mobile phone repairs or repurpose components. The educational representation of participants at Magaba informal market indicates a low to moderate formal education. However, the same results show predominance of practical, and experience-based knowledge. These findings were very useful in the design of inclusive e-waste management system.

#### **4.3.4 Experience**

The level of experience in e-waste collection and sorting as well as generation was very important in this research as it offered critical insight into the practical knowledge, exposure, and operational strategies of individuals who are involved in informal e-waste collection and small-scale retailing. The researcher had an understanding that the depth of one's experience could determine how participants adapt to changes and potentially adopt sustainable practices. The following figure 4.4 shows the level of experience in e-waste generation and recycling by informal collectors and small-scale retailers at Magaba.

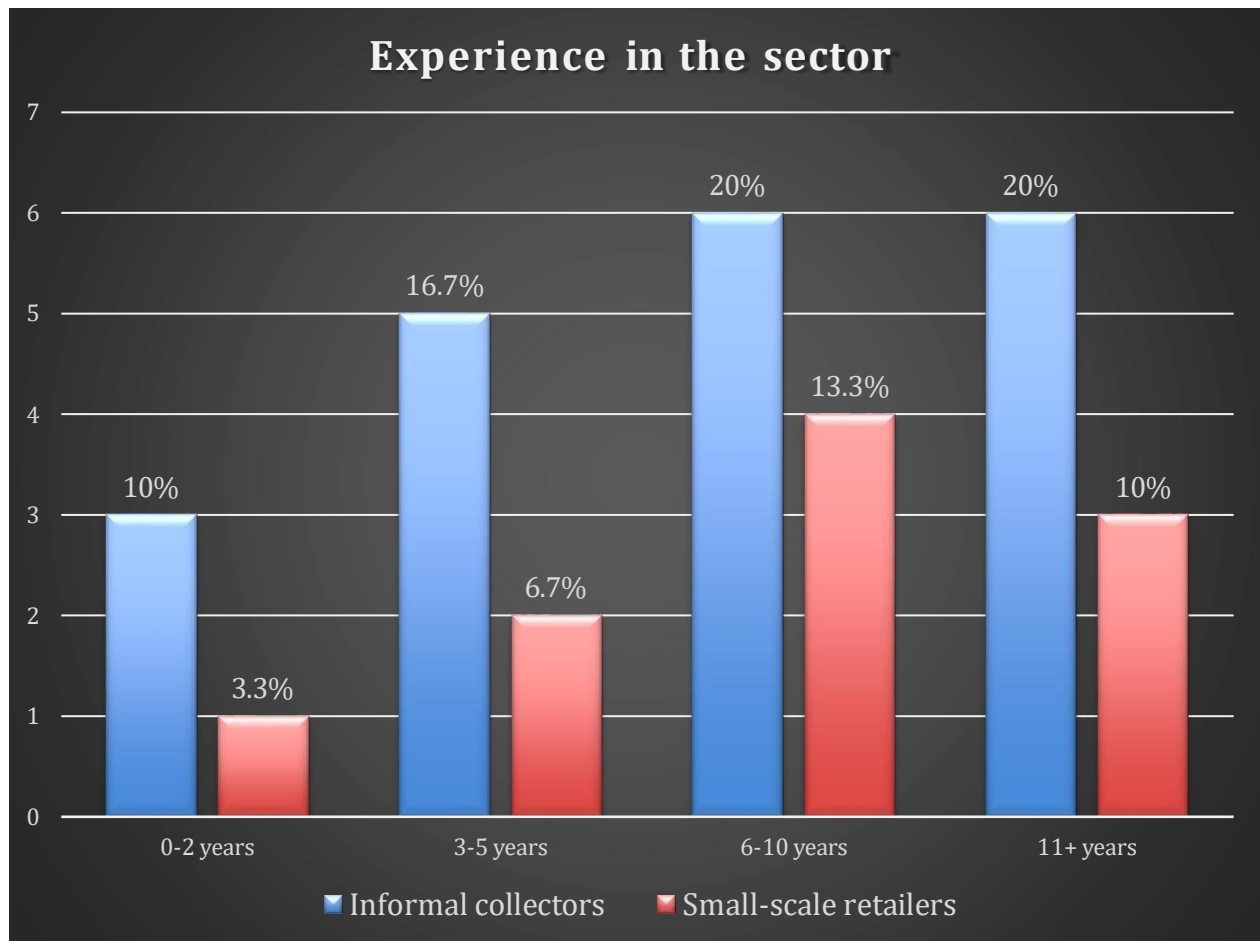


Figure 4. 4 Experience of participants in the sector

**Source: Research Data**

Findings shown in the figure 4.4 above on informal e-waste collectors indicate that many had backgrounds in general waste picking, shifting into e-waste collection due to the higher value of electronic components. This can be shown by those with 35 years and above indicating having more than a decade of experience and also showing a developed knowledge of component grading, resale networks, and repair potentials. However, those with less years of experience ranging from 0 to 2 years were mainly youth below 26 years and workers who previously were in other sectors such as vending but have now been attracted by low barriers to entry in e-waste recycling.

For small-scale retailers participating in the research, most had experience in buying, selling, or repairing second-hand electronics, as shown by 4 out of 10 having 6 to 10 years in this sector. Participants indicated that many retailers started as collectors or informal repairers and grew their

operations with more experience to become shop-based operations. Also, 3 of the 10 participants indicated that they had 11 years and above of experience in the sector and had developed networks with buyers and fixers, which helped them handle larger volumes or diversify into mobile phone accessories and radio parts.

These findings imply that participants with more experience dealing with e-waste recycling are likely to become champions or trainers in community-led recycling models which the researcher found to be a very important input in the sustainable model for e-waste management. Results indicate a wide range of experience among the research participants which suggests that programs that aim to train those involved in e-waste recycling must be divided into basic and advanced, with basic for new entrants and advanced training for those with more experience in the field.

#### **4.4 Data Presentation**

##### **4.4.1 Theme: Current State of e-waste Management among Magaba's Small-scale retailers**

This section presents the research findings derived from in-depth interviews and focus group discussions with small-scale retailers and informal e-waste collectors operating in Magaba, Mbare. The analysis was conducted using Thematic Analysis to identify key patterns, and Narrative Analysis to capture participants lived experiences and personal accounts. The goal was to map out how e-waste is currently managed, perceived, and handled in this informal retail ecosystem. Four major themes that emerged from interviews were: information and lack of structure in e-waste handling; awareness and perception of e-waste and its impacts; infrastructural and logistical challenges in e-waste management; and lack of awareness and knowledge on e-waste hazards and recycling options. The following presents the thematic analysis in detail including narrations from participants.

##### **Sub theme 1: Radios, Cellphone accessories, Computers and TVs**

This theme explores the nature, sources, handling practices, and disposal challenges of e-waste related to consumer electronics commonly sold by Magaba's small-scale retailers. These items generate high volumes of electronic waste due to their affordability, short life cycles, and frequent consumer turnover. Retailers reported selling large volumes of second-hand and low-quality

imported products, particularly radios, phone chargers, earphones, used computers, and TVs. These items often become non-functional within months, leading to high waste generation.

A retailer with a cellphone accessories stall had this to say:

*“We mainly sell secondhand cellphones, new radios and TVs, and other accessories such as chargers and batteries as you can see on my things. These radios and chargers don’t last. Customers return them broken, but we can’t fix them. Most just throw them away nearby.”*

One collector echoed the same that:

*“Many things that we collect from the dumpsite and on various places in Magaba include cellphones that are discarded, radio parts and TV parts. We also get accessories such as cellphone batteries, chargers and connecting wires “*

Similar sentiments were shared by many participants in in-depth interviews and focus group discussions with one young informal recycler saying:

*“Zinhu zvizhinji zvatinhonga mudump umo ma foni anenge asingashandi nema radio akafa. Dzimwe nguva unowana zvinenge zvisina kunyanya kufa stereki ndozvinemari yakawanda taakutengesa. Ma TV nema computer, eeh dzimwe nguva asi ndozvinowandirwa nevanhu saka haaaa kashoma kuzviwana unless wamukira very early.”* (Many things that we pick from the dumpsite are old phones that are not working and radios that are non-working as well. Sometimes we get things that needs small attention to function well and these we sell at high prices. TVs and computers are difficult to find unless you come here very early in the morning)

This theme reveals a situation whereby many sold electronics find their way back to the area as they get to be repaired. This means the accumulation of e-waste can be manageable if small-scale retailers are given a major role to play as sources of collection for e-waste as they were found to

be generation sources. Many respondents indicated having no knowledge of e-waste which can make it difficult to incentivize collectors and coopt them into a sustainable model for e-waste management without proper training. Few retailers engage in repairs due to lack of parts, skills, or cost efficiency. Discarded items often pile up behind stalls or are thrown in open spaces. Computers and CRT TVs, once faulty, are rarely recycled due to their bulkiness. Retailers confessed to dumping or burning e-waste due to lack of collection services. Some components (old computer RAM, chargers) are stripped of parts or sold as scrap, but this practice is inconsistent and often unsafe. Retailers acknowledged the toxic smells from burning plastic parts or exposure to dismantled accessories. However, due to lack of regulation or education, there is little knowledge of proper handling procedures.

### **Sub theme 2: Informality and Lack of Structure in E-Waste Handling**

The most dominant theme that emerged from the data was the absence of formal systems and structures in the handling, storage, and disposal of e-waste among small-scale retailers and informal collectors in Magaba, Mbare. Both groups operate in unregulated environments where decisions on what to do with end-of-life electronics are made on an ad hoc basis, largely guided by space constraints, resale value, or convenience. Small-scale retailers reported using makeshift storage spaces, such as under tables, behind stalls, or in their homes, to keep unusable or old electronics. One retailer operating a phone accessories stall had this to say:

*“We don’t have a proper bin or space for broken things. If there’s no buyer, I just stack them in the corner until I need room for something else. We just pile up old phones and radios in the back until someone comes asking for parts”*

Another small trader admitted that;

*“When the stuff piles up, we throw it behind the market or pay someone to take it. We don’t really know where they take it”*

A long-time electronics seller confessed that;

*“Sometimes, I even hide old radios at home because the council says I shouldn’t block the walkway,”*

Informal e-waste collectors also highlighted the absence of dedicated areas or guidelines to sort, dismantle, or dispose of collected items. They often operate along the road or near dumping sites, improvising tools and spaces as needed. One 22-year-old informal collector explained that;

*“We just sit by the rail line and open up the gadgets with a knife or hammer. No one tells us how to do it. We learn by watching others,”*

Another shared;

*“If it’s useful, I sell it. If not, I dump it nearby. No one cares, and there’s no truck or collection point for this kind of waste,”*

An older collector with over a decade in the sector said:

*“Hapana plan wangu tiri kungoita. kuti zvifambwe otherwise mhuri inofa nenzara vatete. Zimbabwe maI wangu inotoda kuti tishinge zvekutodaro”* “There’s no plan here. Everyone is just doing what they can to survive,”

There is a clear disconnect between supply and disposal. Retailers stock products that are cheap to import and quick to sell but contribute to a growing informal e-waste stream with no clear end-of-life path. Many participants reported that e-waste handling is largely unregulated and unstructured. Retailers and collectors often store and dismantle devices in open spaces or rented stalls with no designated waste zones or guidelines. The theme clearly reflects a decentralized and informal ecosystem, where resourcefulness replaces regulation, and economic necessity outweighs environmental caution. There is no formal waste collection system, no signage, and no capacity for safe e-waste storage or processing. Stakeholders operate with limited information and zero technical support. The story emerging from interviews in Magaba reflects a cycle of survival entrepreneurship combined with limited infrastructure. Retailers, mostly operating from informal

market spaces, view electronics as a high-demand, fast-moving product line. However, behind the profits lies a growing mountain of non-repairable e-waste, accumulating in backyards, drains, or open burning sites.

### **Sub theme 3: Awareness and Perception of E-Waste and Its Impacts**

Another significant theme that emerged from the data was the limited yet growing awareness among small-scale retailers and informal collectors regarding what constitutes e-waste and its potential environmental and health impacts. While most participants had a general idea that old or damaged electronics could be harmful, there was a lack of in-depth knowledge on safe handling, storage, and long-term consequences. Many small-scale retailers equated e-waste with just spoilt gadgets and saw it mainly as unsellable stock rather than a waste category requiring special handling. A retailer selling second-hand electronics said the following:

*“E-waste? I just call them broken radios or phones. We keep them in case someone wants parts,”*

Another retailer said:

*“I don’t throw away these things easily. They can be useful to someone. But I never thought they could be dangerous,”*

Another small-scale retailer who has been in the business for over 10 years said the following:

*“I’ve heard e-waste can harm the environment, but no one teaches us how to handle it properly,”*

Some acknowledged basic environmental concerns but had no access to information or training.

*“We hear on the radio that electronics are not good for the soil or children, but we don’t know what to do with them,”*

Among informal collectors, the awareness level varied depending on experience and exposure. Older collectors generally had a stronger sense of the economic value of e-waste but often underestimated the health hazards. One collector who dismantles devices daily said:

*“I know there’s copper and other things inside. That’s what we want. But I’ve never used gloves or masks. We’re used to it,”*

*“Sometimes I cough after burning wires, but I have to get the metal. I don’t know if it’s really dangerous or just smoke,”*

Another collector admitted:

*“No one has come here to educate us. If we knew better, maybe we’d do it differently,”*

These insights highlight a knowledge gap that presents both a challenge and an opportunity. These sentiments shared by participants during interviews and focus groups indicate that although there can be a general awareness of some benefits financially of collecting e-waste, the absence of a more structured way of sorting out these e-waste hampers the full benefits that can be gained. This makes e-waste management currently at Magaba to be haphazard and unpleasant to authorities and many people who may be more skilled.

#### **Sub theme 4: Infrastructural and Logistical Challenges in E-Waste Management**

One of the dominant issues highlighted by participants was the lack of infrastructure and logistical support for effective e-waste management. This includes challenges with storage space, transportation, collection points, and access to formal recycling centers. Among small-scale retailers, most expressed that their operating spaces were too small to accommodate both usable goods and e-waste. One small-scale retailer said:

*“Isu tinokuvadzwa nemarentals ndokuti kuzochengeta zvinhu zvisingashandi zvinenge zva breaker zvonetsa saka tinongorasa kuseri iko kwamaona kwakazara maradio nema parts emafoni.”* (We don’t have enough space to store broken gadgets. We then end up

throwing them at that pile of broken radios and cellphones accessories you saw outside behind my stall or along the roadside).

One informal collector explained:

*“Tinoshanda pasina security ye zvinhu zvedu sezvamunongoona. Hapana pekuchengetera zvinhu zvakatyoka, zvinongorara panze kusvika zvatorwa nemarara zvongozara pese pese toita senge hatina order. ”* (We work in tight spaces. There's nowhere to keep broken items, they just lie outside until trash collectors pick them up.)

Another added:

*“Mumagaba mu dumpsite umu tinongosanganisa zvese zvakafa nezvisina toungeidza. Pane vanouya vachitenga but vanoita select zvinenge zviri nani vachinoshandisa kugadzira mamwe maphone nema radio zvese nema computer. Asi kune zvimwe zvakaita sema battery zvinonetsa kutengesa nokuti vanhu havazvidi. Ndozvinozoita tsvina yamurikuona yese iyi.”* (Here in Magaba inside the dumping site we mix working and non-working electronic gadgets and put them at same place. Those who come to buy select electronic gadgets that have parts that are still working as they go and use these to repair cellphones, radios and computers as well. However, there are some electronic wastes such as batteries that are hard to sell as those who repair do not like them. These become scattered everywhere like what you are seeing here).

On the part of informal collectors, there was a repeated concern about transportation and inconsistent access to buyers or formal facilities. One young collector had this to say:

*“Ndinofamba nebhasikoro yangu ndichitakura maradio nemaphone akafa. Dzimwe nguva zvinhu zvinorema,”* (I use my bicycle to carry dead radios and phones. Sometimes it's too heavy.)

Another one added that:

*“We don’t know any official places that take e-waste. So we sell to whoever is buying scrap, even if it’s for little money,”*

Another collector remarked:

*“Kana tawanawo zvinhu zvakawanda, hatina pekuzvichengetera. Dzimwe nguva kunonyaya zvinobva zvafa saka unenge waita loss ndokuti vanhu vanotenga ma parts aya vanotoona kuti izvi zvakanaizwa izvi.”* (When we get a lot of waste, we have nowhere to store it. Sometimes it rains and damages everything and those who come to buy will notice so they won't buy which means a big loss)

*“Tingadai tichida kuendeswa zvinhu kune anozviziva, asi hatizive pekutangira,”* (We would love to send items to someone knowledgeable, but we don’t know where to start.)

Echoed a middle-aged collector.

There were no visible collection points in Magaba, and both groups reported a total absence of institutional support or public infrastructure designed for e-waste management. This theme strongly indicates that both informal collectors and small-scale retailers operate in a resource-constrained environment with minimal infrastructural support. The absence of structured collection points, safe storage facilities, and formal disposal channels contributes to environmental hazards and missed economic opportunities.

### **Sub theme 5: Lack of Awareness and Knowledge on E-Waste Hazards and Recycling Options**

A recurrent theme in both in-depth interviews and focus group discussions was the limited awareness among small-scale retailers and informal collectors regarding the environmental and health hazards of e-waste, as well as the absence of knowledge on proper recycling channels. Many small-scale retailers admitted they were unaware of what constituted e-waste or how it should be managed. One retailer said:

*“Honestly, I didn’t know these old phones and radios could be harmful. We just thought it’s junk that has no use,”*

Another trader added:

*“Isu tinogatora zvinhu izvi ku dumpsite kana pavanhu vanogadzira mafoni hatizozivi kuti zvinouraya here kana kuti. Tikanyanyozvitsvaga izvo hatingararami because izvi ndozvinotiraramisa. Asiwo unogona nezvinobuda muma battery umu kuti haaa izvi zviri dangerous izvi.”* (We just collect these broken things from dumpsite and from people who throw away as they repair cellphones. If we are to consider a lot of things we will keep on suffering because these things help us to survive. But sometimes you see things from batteries that these are dangerous)

Another collector echoed the same that:

*“Ini ndinongochengeta zvinhu ndoda kuzotengesa. Handina ruzivo rwekuti zvinokuvadza hutano here. Patinenge tichisota zvinenhu zvatora kudumpsite mukati umo tinopisa kuti tiwane copper. Zvinenge zvichibudisa smell isingaiti but tetisingambofungi kuti iri dangerous”* (I just store items for resale. I don’t know if they harm health. We burn some of the wires to get copper. It smells bad, but we didn’t think it was dangerous.)

This theme reveals critical information and education gaps that undermine efforts to build a sustainable e-waste model. Without knowledge of risks or recycling options, informal actors are likely to continue unsafe practices. It shows the existence of a system of e-waste management that does not bring benefits to anyone, neither the environment nor the people who carry out the informal collection of e-waste. This current e-waste recycling practice at Magaba could be seen to be disastrous, especially to the people involved as they do not have enough skills and knowledge on the long term effects of some the chemical composition of the components they dismantle as indicated by the several collectors. The general consensus on both informal collectors and small-scale retailers (who are the source of e-waste) mainly at Magaba on their ignorance of the health hazards of e-waste handling indicates a huge gap that needs to be closed through a sustainable

model bringing in circularity in e-waste handling. Therefore, from this theme, it can be seen that current e-waste handling practices at Magaba are foregoing many benefits and bringing both environmental and individual health risks that could cost the Council and government money in the future.

#### **4.4.1.1 Observations by the Researcher in Current E-Waste Handling Practices**

The researcher observed that there is a haphazard system of e-waste handling at Magaba. The lack of unstructured systems as confirmed through observations and through interviews indicated that there is more that needs to be done at the informal market to avert a crisis years to come from unregulated e-waste. The following figures show the current e-waste management system at Magaba.



Figure 4. 5 Electronic Waste at Magaba

**Source: Research Data**

This image shows a pile of e-waste mixed with general plastic and solid waste, including old CRT monitors, flat-screen displays, circuit boards, cables, and various discarded electronic components. These are intermixed with plastic bottles, bags, and other domestic refuse, indicating a lack of segregation between e-waste and general waste. This setting reflects a typical informal waste disposal site, likely unmanaged by municipal authorities. The presence of hazardous e-waste in open air, without containment or protective measures, poses significant environmental and health risks including soil contamination, toxic emissions, and human exposure to heavy metals.

The presence of e-waste in an open, unregulated dumpsite highlights the core issues identified in Magaba:

- Lack of formal collection or recycling infrastructure
- Unsafe disposal and burning risks
- Economic disincentives to manage waste properly
- Environmental degradation and public health hazards

This visual evidence strengthens the findings of the study and can be used in the results or problem statement section to illustrate the scale and nature of informal e-waste disposal practices in the area. The image visually reinforces key research findings on e-waste management in Magaba: poor infrastructure, economic survival priorities, and absence of government oversight, leading to unsafe and unsustainable disposal practices.



Figure 4. 6 Electronic waste discarded by informal recyclers

**Source: Research Data**

This image shows a large accumulation of dismantled electronic waste components, such as keyboard casings, metal plates, circuit boards, and plastic panels. The e-waste appears to have been manually stripped or burnt, as evidenced by the ash, soot, and deformed parts, suggesting open burning or crude dismantling practices. The scene reflects a typical informal e-waste processing area where materials are broken down without safety gear or environmental safeguards.



Figure 4. 7 Informal Recyclers at Magaba

**Source: Research Data**

This image captures three informal workers sorting through e-waste, surrounded by old circuit boards, remotes, radios, and dismantled electronic components. The environment is visibly makeshift and unhygienic, with no protective gear or tools in use. The individuals are handling potentially hazardous items with their bare hands, highlighting the unsafe and unregulated nature of e-waste recovery in Magaba. Key observations from the image that align with the research findings:

- Workers are salvaging parts that may still hold value (remotes, boards, speakers), which supports findings that economic necessity drives informal e-waste recovery.

- The absence of bins, protective clothing, or proper dismantling areas reinforces the infrastructure and policy vacuum in Magaba
- Direct contact with components likely containing lead, cadmium, or mercury underscores the public health danger informal recyclers face daily.

This image visually supports the theme of economic survival amid environmental and health neglect, a central thread throughout the study's thematic analysis.

#### **4.4.2 Theme: Barriers to Effective E-waste Recycling in Magaba**

Five major themes emerged from the interviews on this objective. The analysis draws from interviews with retailers and informal recyclers, to explore the key challenges that hinder sustainable e-waste recycling in this area. Through both thematic coding and narrative analysis, this section identifies the socio-economic, infrastructural, institutional, and knowledge-based barriers that define e-waste management in Magaba. The themes that emerged are interconnected and reflect a broader systemic issue of neglect, informality, and policy gaps. The themes include lack of combined efforts, lack of incentives, infrastructural gaps, lack of policy clarity and

##### **Sub theme 1: Lack of Formal Infrastructure and Collection Systems**

Findings show that there is no structured e-waste collection service or designated recycling infrastructure in or around Magaba. This came out as one of the most pressing barriers to effective e-waste recycling in Magaba as the absence of formal infrastructure to support safe and sustainable disposal. Findings from the interviews indicated that neither the City of Harare nor any private entity has established collection points, segregation bins, or transport systems for e-waste in this informal market space. As a result, small-scale retailers and informal collectors are left to improvise or neglect disposal altogether, leading to environmental pollution and health hazards.

One retailer who deals with radios and speakers said;

*“We don't have a place where we can take broken things. Even if you ask other sellers, they'll tell you we just throw them behind our stalls or burn them.”*

An informal collector also said:

*“I only collect what can be sold, like copper wires or metals. But most electronics, especially broken TVs and computer monitors, are too heavy or have no value. So, I leave them.”*

Another cellphone trader echoed:

*“Sometimes customers leave damaged phone parts here. I keep them for a while, hoping to reuse some, but eventually I dump them with other rubbish because there’s no one who comes to collect.”*

The absence of infrastructure reflects systemic neglect. Traders operate in survival mode, and waste management is often an afterthought. Across multiple interviews, a consistent narrative of abandonment emerged. Retailers feel invisible in national or local waste management strategies. Their businesses generate waste daily, yet there is no system to guide or support its proper handling. Instead, informal dumping, in alleys, behind shacks, or into nearby streams has become normalized. Even well-meaning actors who might want to recycle are disempowered by the lack of options. A few mentioned attempts to store or repurpose components, but due to space constraints and lack of buyers, this was short-lived. Informal collectors, who often focus on valuable scrap metal, ignore non-valuable e-waste further compounding the problem. The absence of recycling channels means that even willing participants have no pathway to act responsibly.

## **Sub theme 2: Limited Knowledge and Awareness of E-waste Risks**

A major barrier to effective e-waste recycling in Magaba is the widespread lack of awareness and understanding of what e-waste is, how it should be handled, and the risks associated with its improper disposal. Most small-scale retailers and informal collectors do not distinguish e-waste from general waste, and very few understand the health and environmental dangers of exposure to hazardous components such as lead, mercury, and cadmium found in electronics. This theme reveals a significant knowledge gap not only about the risks of e-waste but also about the existence of recycling options or safe disposal methods.

A retailer who sale TVs and does repairs said:

*“Ndongonzwawo vamwe vanhu cm achiti ma TV akafa Aya ane zvinhu zviru dangerous especially aya kudhara but handimbozvinzwisisi ini. Isu tinongomasiya panze kana tabvisa ma parts atinoda.”* (I’ve heard people say old TVs have dangerous things inside, but I don’t really know what they mean. We just leave them outside or break them for parts.)

One informal collector also added:

*“I collect motherboards and wires because they sometimes have copper. I didn’t know that breaking them with my hands could be dangerous.”*

Another informal collector who also repairs cellphones said:

*“Isu hatimbooni problem yema charge nema earphones. Zvinhu zvidiki izvi hazvina basa rakanyanya hapana pataimbofunga kuti zvinogona kukanganisa nzvimbo”* (We don’t think of chargers or earphones as waste. They’re small. We just throw them away. We’ve never been taught that it could be harmful)

This gap in knowledge contributes to casual attitudes toward disposal. The narrative of many traders is shaped by prioritizing immediate income over long-term environmental or health risks. E-waste is seen as normal junk, not hazardous material. A recurring story among participants is that e-waste is viewed as harmless junk, with little attention given to its chemical or environmental risks. Many associate danger with only visibly broken items like cracked screens or leaking batteries, while smaller items like earphones, chargers, and USB devices are discarded with household trash. There is no formal education or public messaging about the dangers of e-waste in the area. Even informal recyclers who dismantle equipment daily show limited understanding of protective measures. The absence of gloves, masks, or any handling precautions is common. The narrative of just doing what they can to survive outweighs any perceived long-term risk. The limited knowledge and awareness of e-waste risks among small-scale actors in Magaba is a critical barrier to safe and sustainable recycling. This gap not only increases exposure to toxic substances but also perpetuates environmentally harmful practices.

### **Sub theme 3: Absence of Government or Municipal Support**

Another critical barrier to effective e-waste recycling in Magaba is the complete absence of visible support, regulation, or intervention from government bodies or municipal authorities. Traders and collectors consistently expressed a sense of neglect and exclusion from formal waste management frameworks. Despite being a high-density market known for its electronic goods, no official policies, collection systems, or training programs have been extended to Magaba by Harare City Council or the Environmental Management Agency (EMA). Respondents repeatedly mentioned that there is no government outreach, no training, and no visible regulation around e-waste recycling. They feel abandoned and uninformed.

A retailer of second-hand electronic goods said:

*“Hatisati tamboona council uchiita hanya nezvinhu zvakafa izvi. Pavanouya muno mumagaba chavo kubvunza malice se nekutora Mari yema table chete. Zve tsvina izvi havaneyi nazvo. Hanti munongoonawo matutu nematutu nezvinhu zvakaraswa zvavanemakore panze apo”* (We’ve never seen the council doing anything about these broken items. They only come to collect market fees, not waste. They don’t care about waste as you can see all those piles outside. Things have been like this for years)

This was shared by an informal collector with many years at Magaba:

*“I’ve worked here for years, and I’ve never heard of a government truck coming to collect electronics. We are on our own.”*

Another retailer who sells radios and computer accessories said:

*“If there were bins or collection days, I would use them. But nothing is provided. They act like we don’t exist.”*

The dominant narrative is one of institutional silence. Despite the growing volume of e-waste in Magaba, local authorities have not engaged in the informal sector, leaving traders to manage their waste with no knowledge, tools, or oversight. There is a strong sense of institutional neglect. The informal sector feels excluded from national waste management plans. This has fostered a culture of independence where traders rely on informal methods or do nothing at all. Several participants stated that they would welcome municipal involvement but felt that informal businesses were not

a priority for the government unless fees or enforcement were involved. The lack of communication, infrastructure, and inclusion suggests a systemic failure to recognize the informal sector as a key stakeholder in national e-waste management. As a result, traders perceive waste handling as a personal burden, not a shared civic responsibility. Some of the emerging patterns are no formal e-waste collection days or services in Magaba, absence of collaboration between EMA and informal traders, council visits are associated only with fee collection or eviction, not support, and missed opportunity for public-private partnerships in waste recovery.

#### **Sub theme 4: Economic Disincentives and Survival Priorities**

Economic pressures play a decisive role in the way e-waste is managed in Magaba. For most small-scale retailers and informal collectors, the primary goal is daily income generation, not environmental stewardship. E-waste recycling is viewed as a non-profitable, time-consuming activity, with no clear financial benefits. The absence of monetary incentives, buyers, or organized buy-back schemes renders e-waste recycling a low priority in a context where survival depends on fast, cash-based transactions. Recycling e-waste is not financially rewarding for most traders. Time spent separating or storing waste is seen as a cost. There is no known buyer or incentive to recycle, and space constraints discourage long-term storage

A retailer who sale second-hand phones said:

*“If recycling paid money like selling phones, maybe we’d care. But right now, I just need to sell and make rent. I don’t have time for junk.”*

An informal collector also said:

*“I only take wires and batteries if I know someone will buy them. Things like broken screens or old remotes, no one wants them. So we burn or dump them.”*

Another retailer added:

*“There’s no buyer for most of the broken parts. Storing them takes up space, and space is money. I’d rather clear it out and bring in new stock.”*

Another retailer also added:

*“I’ve never heard of anyone making money from old TVs unless they remove copper. If recycling was profitable, we would already be doing it.”*

The shared narrative reveals that economic survival overrides environmental action. Traders and collectors operate in narrow profit margins, often working hand-to-mouth. Time, space, and effort must directly contribute to income, anything else is seen as wasteful. Without financial returns, there is no perceived value in proper e-waste management. Even where some components such as copper wires, and aluminum casings, are salvaged, this is done only if profit is guaranteed. The rest of the waste, which has no immediate resale value, is discarded in unsafe ways. The lack of structured incentives or partnerships with recycling companies means even traders willing to participate are discouraged by the economic cost of handling e-waste properly. The emerging patterns from the interviews include that recycling is not seen as economically viable, high opportunity cost of storing or sorting e-waste, no access to formal recyclers or buy-back networks, and perception that recycling must generate income to be worth doing.

#### **Sub theme 5: Informal Handling and Unsafe Practices**

In the absence of formal e-waste management systems, small-scale retailers and informal collectors in Magaba have developed informal and often hazardous methods of dealing with e-waste. Dismantling, burning, and dumping are common practices carried out without protective equipment or awareness of the health risks. These methods pose serious dangers to both the environment and human health, particularly through exposure to toxic substances such as lead, mercury, and cadmium found in components of old electronics.

One informal collector said:

*“Tinongovhura ma computer cpu totora maparts anotengeseka sema Ram nezvimwe. Zvisina basa torasa or kupisa.”* (Sometimes we open up CPUs and take out anything that still works, RAM, fans, chips. The rest we throw away. No gloves, nothing. It’s just part of the job)

Another young collector added:

*“We burn the wires to get copper. The smoke is bad, but it’s the only way we know. No one has taught us any other method.”*

A retailer echoed:

*“Those big old TVs are heavy and useless. I break them open to remove small parts. The rest just stays outside until someone clears it.”*

The dominant narrative is one of adaptation under constraint. Traders and collectors are aware that some of their practices are unsafe, but they lack both alternatives and education. Their methods have been shaped by necessity, passed down informally, and prioritise usefulness and speed over safety. Many are unaware of the invisible risks like inhaling fumes or exposure to heavy metals focusing only on what can be reused or sold. The widespread use of open burning to retrieve copper is particularly hazardous but remains popular due to its speed and simplicity. No safety training, protective gear, or health support is provided by authorities, NGOs, or employers. The experiences of Magaba traders and informal collectors reveal a reality where e-waste recycling is neither supported nor understood. In this space, where economic survival dictates behavior, the lack of infrastructure, education, and institutional support creates a system where poor e-waste practices are normalized.

## **4.5 Discussion of Findings**

### **4.5.1 Current E-Waste Handling Practices in Magaba**

Research findings seem to suggest that in Magaba, e-waste is mainly recycled through informal ways such as burning in open spaces, dumping, and unregulated dismantling. Majority of participants indicated that this was mainly prevalent due to the unstructured way in which small-scale retailers who repair and sometimes sell electronics throw away gadgets that are no longer in use. Findings also indicated that the unregulated e-waste recycling at Magaba is driven by the absence of formal waste management systems and the need for immediate income. This is in contrast with e-waste management practices in countries such as South Africa (Godfrey et al., 2021) and India (Manomaivibool et al., 2020), where a semi-formal system exists which empowers both informal collectors and those in the value chain. However, similar to findings from Magaba

were e-waste systems in Ghana and Lagos where it was indicated that these methods are prevalent and, in these cases, the informal sector dominate e-waste processing due to the lack of formal infrastructure (Oguntoye et al., 2020). It can therefore be seen that e-waste recycling system at Magaba is characterized by informalized and unstructured system that is operated by informal players.

Another major finding from the research was that the economic situation is a significant factor influencing how e-waste activities are carried out at Magaba. The haphazard way in which e-waste recycling activities are carried out at Magaba points towards a situation where each individual involved is Individuals prioritize income generation over environmental or health considerations, leading to the adoption of hazardous recycling methods. This economic-driven approach to e-waste management is common in low-income settings, where survival needs often override other concerns (Oteng-Ababio et al., 2020).

As previously discussed, the lack of awareness about the dangers of improper e-waste handling contributes to unsafe practices. Education and training are essential to inform individuals about safer methods and the importance of proper e-waste management. The lack of formal support systems, including collection centers and recycling facilities, forces individuals to rely on informal methods. This absence hinders the development of sustainable e-waste management practices. In regions where formal infrastructure has been introduced, such as the planned e-waste eco park in Delhi, there is potential for improved e-waste management and the integration of informal workers into formal systems (Singh & Panwar, 2020).

#### **4.5.2 Barriers to Effective E-Waste Recycling in Magaba**

The study revealed a significant lack of awareness among participants regarding the hazards of improper e-waste handling. Many informal collectors and small-scale retailers were unaware of the environmental and health risks associated with practices like open burning and improper dismantling. This finding aligns with global observations where informal e-waste workers often lack knowledge about the dangers of their activities. For instance, in Agbogbloshie, Ghana, workers exhibited limited awareness of the health hazards posed by e-waste processing, attributing health issues to other causes like malaria or sun exposure (Gollakota et al., 2020). However,

compared to regions like Nairobi, Kenya, where NGOs have partnered with recyclers to introduce collection centers (Wairimu et al., 2018), Magaba lags behind due to a total lack of intervention from both municipal authorities and civil society.

Participants highlighted the absence of formal infrastructure for e-waste collection and recycling in Magaba. The lack of designated drop-off points or recycling facilities forces individuals to resort to informal and often hazardous disposal methods. This situation is not unique to Magaba. In many developing countries, the absence of proper e-waste management infrastructure leads to reliance on informal sectors for e-waste processing, which often lacks environmental and health safeguards (Andeobu, et al., 2023). This is consistent with findings from Addis Ababa (Ethiopia), where informal workers handle toxic components without knowledge of their effects (Asfaw et al., 2019). However, in contrast, South Africa has introduced community-level awareness campaigns and educational programs (Mantzaris, 2020), helping to reduce risky practices. This comparison highlights the potential impact of targeted education and awareness in shaping safer behavior.

Economic necessity drives many individuals in Magaba to engage in informal e-waste recycling. The immediate financial benefits of extracting valuable materials from e-waste often outweigh concerns about health and environmental impacts. This mirrors findings in other regions where economic pressures compel individuals to participate in informal e-waste activities despite the associated risks (Ongondo et al., 2015). Similarly, in Delhi, informal recyclers only recover materials with immediate resale value (Gupta & Sinha, 2020). However, Vietnam and Ghana have piloted buy-back centers and cash-for-waste schemes, demonstrating that economic incentives can shift attitudes toward more sustainable practices.

The study found that existing policies on e-waste management are poorly enforced in Magaba. Participants reported minimal government oversight and a lack of clear guidelines on proper e-waste disposal. This reflects a broader trend in many developing nations where regulatory frameworks exist but are inadequately implemented, leading to ineffective e-waste management (Manomaivibool et al., 2020). Participants often did not associate their health issues with e-waste handling practices. Symptoms like respiratory problems were common, yet few linked them to exposure to toxic substances from e-waste. This lack of awareness is consistent with findings from

other studies where informal e-waste workers underestimate or are unaware of the health risks associated with their activities (Daum et al., 2017).

The findings from Magaba align with global patterns observed in e-waste management in developing countries. Common themes include the dominance of informal sectors, lack of infrastructure, economic drivers, and insufficient policy enforcement. Studies across Africa and Asia have documented similar challenges, emphasizing the need for comprehensive strategies that address economic, infrastructural, and educational aspects of e-waste management (Awasthi et al., 2016; Akormedi et al., 2017). However, while many regions face similar challenges, some have made strides in integrating informal workers into formal systems and developing infrastructure for e-waste management. For example, initiatives in Ghana have provided training and equipment to informal workers, reducing hazardous practices (Akormedi et al., 2017). Magaba, however, lacks such initiatives, highlighting a divergence in the implementation of solutions to e-waste challenges.

#### **4.6 Chapter Summary**

The findings revealed a deep-rooted system of e-waste recycling that is not structured, haphazard and dangerous to the community of Magaba. There are several barriers that were found to be hampering the creation of a structured e-waste management system and some of barriers include the absence of incentives, infrastructure and government support. The chapter presented findings from the research and analysis of the findings. The following chapter presents research conclusions and recommendations. The model will be presented in the last chapter.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

The previous chapter presented findings from the research using thematic and narrative approach. This chapter presents summary of the research, research conclusions, recommendations and the e-waste management model. These conclusions and recommendations are formulated based on the findings from the research based on three research objectives outlined in the first chapter.

#### **5.2 Conclusions**

The conclusions are based on the objectives outlined in the first chapter:

##### **5.2.1 The current state of e-waste management among Magaba's small-scale retailers.**

The current system of e-waste management in Magaba is primarily informal, unsystematic, and lacks environmental safeguards. Electronic waste, mainly old cellphones, radios, computers, and TVs is dismantled and sold by informal recyclers using crude methods. Small-scale retailers contribute to both e-waste generation and informal reuse, but there are no structured take-back systems or regulated recycling facilities. From the Sustainability Theory perspective, this system fails to achieve environmental, social, or economic sustainability. The absence of environmental control contributes to soil, air, and water pollution; socially, it exposes informal workers to hazardous conditions; economically, it limits long-term value creation and waste reduction.

Informed by the Stakeholder Theory, the current setup reflects poor integration of key actors such as local authorities, informal recyclers, consumers, and businesses whose interests are not aligned or formally engaged. Government actors remain passive, while private stakeholders (retailers and consumers) operate with minimal awareness or accountability. Studies such as Otieno et al. (2019) in Kenya and Amoah & Boateng (2021) in Ghana found similar conditions in informal e-waste hubs, with limited infrastructure and informal labor dominating the sector. However, unlike

Magaba, some regions have introduced pilot collection points or public-private partnerships, showing potential pathways for reform that are absent in Magaba.

### **5.2.2 Barriers to effective e-waste recycling in Magaba**

The research identified key barriers including lack of policy enforcement, low public awareness, absence of incentives, unsafe handling methods, and exclusion of informal actors from formal systems. These challenges reinforce the stagnation of e-waste management in Magaba. The Sustainability Theory explains that these barriers hinder transition to a circular economy, where product life cycles are extended and resources are reused. Without government support and investment in eco-friendly systems, sustainability remains unachievable.

The Stakeholder Theory highlights that excluding informal recyclers from policy dialogues and planning deprives the system of key operational knowledge and social legitimacy. Informal actors are crucial in collection and recovery, yet they lack legal recognition or support. Research by Osei-Bonsu et al. (2020) in Accra and Mukherjee et al. (2018) in India reported similar constraints but noted gradual progress where local governments engaged informal actors through training and incentives. In contrast, Magaba remains fragmented and policy deficient.

## **5.3 Recommendations**

From the findings, the following recommendations were created based on the research objectives:

### **5.3.1 The current state of e-waste management among Magaba's small-scale retailers.**

- Based on the findings that the current e-waste management system at Magaba is characterized by informalization and chaos, the government should recognize informal recyclers by registering and training them, turning their operations into legally acknowledged micro-enterprises. This enhances safety, efficiency, and accountability.
- The government, together with Harare City Council should set up localized e-waste drop-off centers in Magaba, supported by both government and private stakeholders. These points should offer small financial incentives or service discounts to encourage proper disposal.

- City authorities should draft and enforce policies that regulate the collection, sorting, and recycling of e-waste in informal markets like Magaba, aligning them with national waste management strategies.

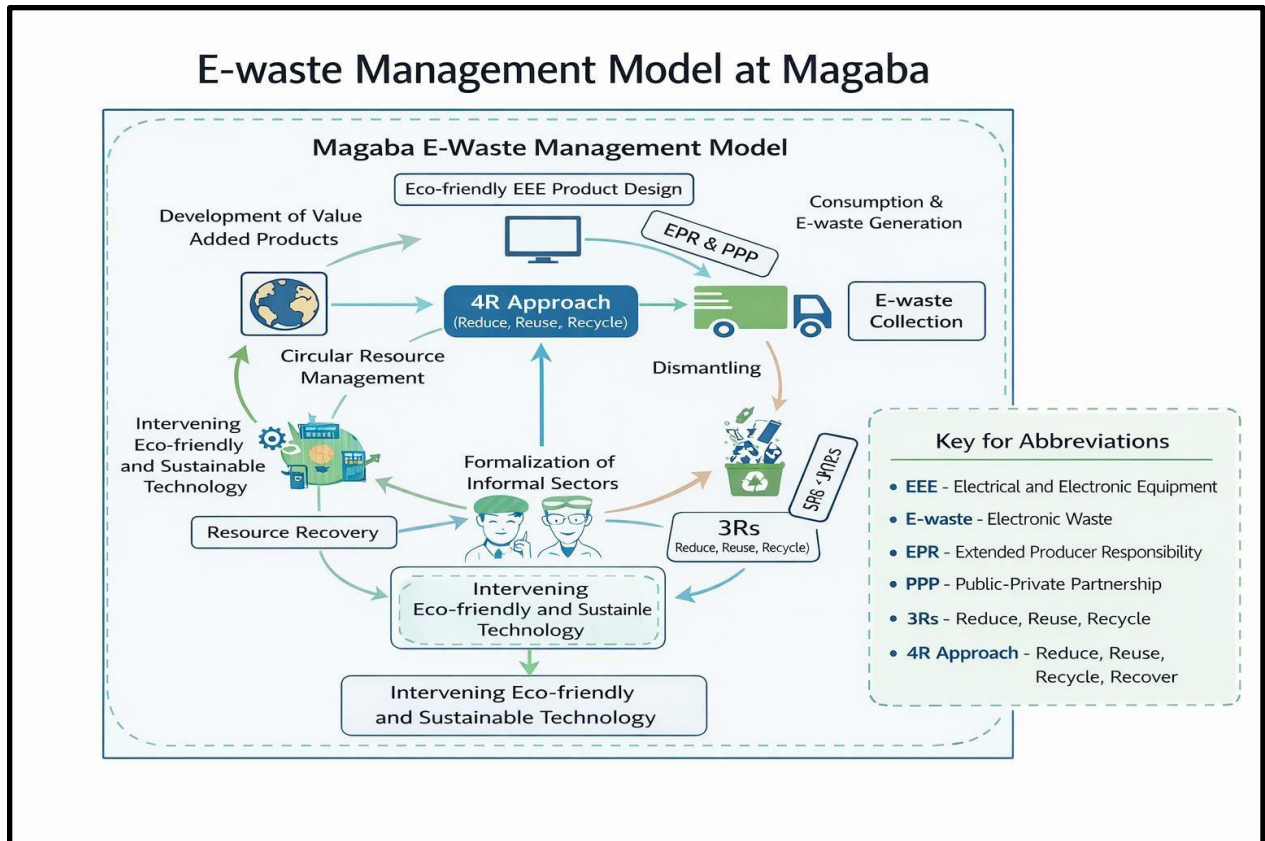
### **5.3.2 Barriers to effective e-waste recycling in Magaba**

Based on the findings, it is recommended that:

- The government and other responsible parties should implement targeted campaigns to inform the community about the dangers of poor e-waste handling and the benefits of sustainable practices, using radio, posters, and community workshops.
- The government together with Harare City Council should equip informal workers with knowledge on safe dismantling techniques and hazard identification, reducing exposure to toxic substances and improving material recovery quality.
- In order to reduce infrastructure gaps, the government and Harare City Council should attract investment in micro-recycling enterprises and partnerships with local actors to introduce scalable, low-cost recycling technologies suitable for Magaba's informal setting.

## **5.4 Model**

Based on the findings presented in chapter 4, the researcher came up with the following sustainable e-waste management model which aims to create circularity in e-waste management at Magaba. The proposed Magaba e-waste management model is designed around circular economy principles, aiming to reduce environmental harm, create economic opportunities, and formalize informal actors.



**Figure 5. 1 Business Model for e-waste recycling at Magaba**

**Source: Research Results**

### Model Description

The Magaba E-waste Management Model is designed for a circular economy addressing the challenge of e-waste in informal areas such as Magaba. The designed model takes into consideration that e-waste management should not begin at the point of disposal, but rather at the stage of product design. Therefore, the model encourages eco-friendly Electrical and Electronic Equipment (EEE) product design, suggests that manufacturers and producers should create products that are durable, repairable, recyclable, and less hazardous to the environment. This upstream approach reduces the volume and toxicity of waste generated after consumption, thereby lowering the burden on waste management systems.

The model further explains that consumption leads to e-waste generation in areas such as Magaba where informal repair, refurbishment, and metal fabrication activities are common. Once products

reach the end of their useful life, an organized collection system becomes essential. E-waste collection in the model serves as the gateway to responsible waste handling because it prevents indiscriminate dumping, burning, or disposal in landfills. Effective collection mechanisms may include designated drop-off centers, scheduled pick-ups, or partnerships with informal collectors. In Magaba many operators rely on informal systems, structured collection channels would help capture valuable discarded electronics while reducing environmental impact.

After collecting, used electronic gadgets are dismantled, which is an important stage in the model. At this stage, electronic products are separated into components such as plastics, metals, circuit boards, cables, and reusable parts. This stage is important in the model because informal e-waste recyclers already possess some skills in repair and disassembly. If formalized and supported with safe working conditions, dismantling can create employment opportunities while improving material recovery efficiency. Training reduces exposure to toxic substances such as lead, mercury, and cadmium. The model therefore implies the need for safer technologies and regulatory oversight during this phase.

A central feature of the model is the 4R Approach: Reduce, Reuse, Recycle, and Recover. This philosophy shifts waste management from disposal to resource efficiency. Reducing means minimizing unnecessary consumption and avoiding short-life electronics. Reuse involves extending product life through repair, refurbishment, and resale, which is already common in Magaba. Recycling refers to processing discarded materials into new raw materials, while recovery focuses on extracting valuable metals such as copper, aluminum, and gold from obsolete devices. By integrating the 4Rs, the model supports a circular economy where waste becomes a productive resource rather than an environmental liability.

The concept of circular resource management reinforces this perspective by showing that recovered materials can re-enter production systems. Instead of a linear model where products are made, used, and discarded, the Magaba framework promotes a closed-loop system where materials circulate repeatedly. This is especially important in Zimbabwe, where imported raw materials can be expensive and scarce. Recovered metals and reusable parts from e-waste can lower production

costs for local enterprises, stimulate innovation, and reduce dependence on imports. Thus, the model links environmental management directly with economic development.

Another significant component is the development of value-added products. This means that materials extracted from e-waste can be transformed into new commercial products such as refurbished electronics, metal tools, spare parts, artistic products, or industrial inputs. For Magaba, a hub of engineering creativity and entrepreneurship, value addition offers an opportunity to convert waste streams into income streams. Rather than treating e-waste as useless refuse, the model recognizes it as a source of business growth, employment creation, and local industrialization.

The model also emphasizes the formalization of informal sectors. Many e-waste activities in Magaba are undertaken by informal traders, repairers, and scrap dealers operating outside regulatory systems. Formalization would involve registration, training, licensing, access to finance, and inclusion in official waste management programs. This process can improve occupational safety, tax compliance, environmental accountability, and productivity. It also enables policymakers to harness the experience and networks of informal workers instead of excluding them. In practice, successful e-waste systems in developing economies often depend on integrating rather than eliminating informal actors.

The model emphasizes the inclusion of Extended Producer Responsibility (EPR) and Public-Private Partnerships (PPP) which demonstrates the governance dimension of the model. EPR places responsibility on producers and importers to finance or manage take-back, recycling, and disposal of their products after use. This ensures that waste costs are internalized by businesses rather than shifted to society. Public-Private Partnerships encourage collaboration between government agencies, municipalities, recyclers, and private investors to build infrastructure, provide technology, and improve service delivery. For Magaba, these mechanisms can mobilize resources that individual operators or local authorities may not possess alone.

## **5.5 Areas of Further Research**

The findings on this research revealed an unstructured e-waste management system at Magaba. The research further indicated several barriers to proper e-waste management. The developed model does not take into consideration consumer behavior and attitudes towards e-waste management, and the financial sustainability of such a model in low-income markets such as Magaba. Therefore, the researcher recommends the following as areas for further investigation:

- Explore effective strategies for integrating informal recyclers into formal waste systems without disrupting their livelihoods.
- Financial sustainability of circular e-waste systems in low-income settings like Magaba. This includes cost-benefit analyses of collection points, refurbishment operations, and material recovery.

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## **APPENDIX 1: INTERVIEW GUIDE**

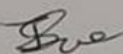
### **Introduction:**

My name is JACQUELINE MAFA, a Masters student in Entrepreneurship and Innovation at BINDURA UNIVERSITY OF SCIENCE EDUCATION carrying out a study which reads, “A Working Model for Sustainable E-Waste Recycling in Small-Scale Retail: A Case Study of Magaba, Mbare.” I would like to conduct an interview concerning the topic mentioned above. This research is carried out under the ethical practices of Bindura University of Science Education. Therefore, I would like to assure you that all the data obtained in the research is for academic purposes and will be kept in very safe place and will be incinerated after 6 months. I would like to ask for your verbal consent to take part in this research.

1. Do you understand the term electronic waste?
2. How is electronic waste collected and disposed at Magaba?
3. What is the current situation on electronic waste management at Magaba?
4. What is the role of informal collectors in the collection of electronic waste at Magaba?
5. Do you think people are doing enough to ensure electronic waste management at Magaba?
6. Do you think small-scale retailers are doing enough to ensure that they get involved in the collection of electronic waste?
7. If you think they are doing enough or not, explain further.
8. What challenges are faced at Magaba in ensuring proper electronic waste management?
9. What do you think the government and the City of Harare can do to reduce the challenges above?
10. What do you want to see in a new model of electronic waste management at Magaba?

Thank you for your participation in the research

### APPENDIX 3: RESEARCH APPROVAL LETTER

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| <br>CITY OF HARARE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>HUMAN CAPITAL DEPARTMENT<br/>TOWN HOUSE, HARARE, ZIMBABWE<br/>POST OFFICE BOX 990<br/>TELEPHONE 752979 / 753000</p> <p>EMAIL: hrd@hararecity.co.zw<br/>ADDRESS ALL CORRESPONDENCE TO HUMAN CAPITAL DIRECTOR</p> |
| <p>Bindura University of Science Education<br/>P. Bag 1020<br/><u>Bindura</u></p> <p>07 August 2025</p> <p><b>RE: <u>AUTHORITY TO UNDERTAKE RESEARCH: JAQUELINE MAFA</u></b></p> <p>This letter serves as authority for Jaqueline Mafa undertake a research survey on the topic:<br/>“A WORKING MODEL FOR SUSTAINABLE E-WASTE RECYCLING IN SMALL –<br/>SCALE RETAIL :A CASE STUDY OF MAGABA ,MBARE.”</p> <p>The City of Harare has no financial obligation and neither shall it render any further assistance in the conduct of the research. The researcher is however requested to avail a soft and hard copy of the research to the undersigned so that residents of Harare can benefit out of it. The research should not be used for any other purpose other than the study purpose specified.</p> <p><b>This letter is issued upon payment of 5usd administration fee.<br/>Receipt number: 15663270</b></p> <p>Yours faithfully</p> <div style="margin-top: 20px;"><br/>_____<br/>MR J. DUVE<br/>ACTING HUMAN CAPITAL DIRECTOR</div> <div style="margin-top: 20px; text-align: right;"><div style="border: 1px solid black; padding: 5px; display: inline-block;"><p>CITY OF HARARE<br/>HUMAN CAPITAL DEPT.<br/>15 AUG 2025<br/>P.O. BOX 990, HARARE<br/>TEL 752979</p></div></div> |                                                                                                                                                                                                                    |
| <p>Harare to achieve a WORLD CLASS CITY STATUS by 2025</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                    |

APPENDIX 4: TURNIT IN REPORT

