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PLASTIC WASTE MANAGEMENT STRATEGIES TO REDUCE WATERWAY BLOCKAGES IN LOCAL AUTHORITIES. A CASE OF CITY OF HARARE, ZIMBABWE

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTER OF SCIENCE DEGREE IN ENTREPRENUERSHIP AND INNOVATION, GRADUATE SCHOOL OF BUSINESS

JUNE 2024

Approval Form

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Declaration

I, Marvellous Tariro Chisvo Student Reg Number B226850A, do hereby declare that this dissertation is a result of my own investigation and research, except to the extent indicated in the acknowledgments, bibliography, references, and comments included in the body of the report, and that it has not been submitted in part or in full for any other degree to any other university.

STUDENT SIGNATURE **DATE: 10 JUNE 2024**

Dedication

This project is dedicated to my parents (Mr OC Chisvo and the late Mrs S Chisvo) who made it possible for me to reach this level of education through their perseverance, faith and commitment towards my studies.

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I wish to express my sincere gratitude to my supervisor Dr RM Rusike for his continued guidance and advice on the content without which this Dissertation would have been a non-event. Dr RM Rusike has been a primary source of guidance throughout the process. I would also want to thank my family (Husband, Onward, Mufaro and Thabo) for their unconditional support and love throughout this process. Special mention goes to my friends for their support and inspiration that made this Dissertation a success. To MEI class of 2024 thank you very much for your inspiration and believing in me as your classmate for the past 18 months. God bless you all (Psalms 127 verse 1)

My greatest appreciation goes to God the Almighty and the father of our Lord and Saviour Jesus Christ who made the whole study process possible.

Abstract

The purpose of this study is to evaluate the management strategies in reducing the waterway blockages in local authorities accumulated by plastic waste. The main objective of the study was to develop a framework of strategies which could see the City of Harare reduce water ways blockage. Other subsidiary objectives included analysis of the current challenges, impact, policies and regulations with a view of establishing their effectiveness. Furthermore, theoretical, conceptual and empirical literature review was conducted to establish what past scholars highlighted on both the independent and dependent variables. The methodology of the study took and mixed method approach made up of both the quantitative and qualitative methods and adopted an explanatory research design. Probability and convenient sampling methods were used on the quantitative and qualitative methods respectively and questionnaires and personal interviews were used as research instruments accordingly on 30 individuals internal and external of the City of Harare. This diverse population included representatives from the city's top management, the waste management department, environmental agencies, the private sector, and other relevant departments. The major findings were that the current strategies used by the City of Harare were manage waste were ineffective due to prevailing challenges of a lack of robust waste management infrastructure, financial constraints, ineffective policies and regulations, and limited public awareness and engagement and yet the impact of plastic waste is severe. Strategies of innovative waste management, recycling, upcycling, educational campaigns, collaborations and enhanced regulations and policies were critical for reduction of waterways blockage. It was recommended that the proper implementation of a comprehensive overhaul of the waste management system in Harare to address the ineffective current practices should involve a holistic approach that considers the interconnectedness of the various components within the system.

Keywords: Management strategies, City of Harare, Policy, Plastic waste, Waste management infrastructure

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Abbreviations and Acronyms

LA - Local Authorities

HCC - Harare City Council

WASH - Water, Sanitation and Hygiene

ISWM - Integrated Solid Waste Management

MEPIP - Ministry of Environment, Climate, Tourism and Hospitality Industry

ZINWA - Zimbabwe National Water Authority

EPC - Environmental Planning and Climate

EMA - Environmental Management Agency

Chapter I

Introduction and Background

1.0 Introduction

The chapter concerns a research aimed at addressing the issue of plastic waste reduction in Harare's Central Business District (CBD) streets as well as its impact on waterways blockage. The study focuses on the case of Harare Municipality in Zimbabwe, where plastic waste has become a significant environmental challenge, leading to clogged waterways, flooding and various health hazards.

The City of Harare is governed by the Harare Municipality. According to the Harare City Council (2024) the Harare Municipality is structured into various departments and divisions, each responsible to perform specific functions. Overall, the municipality is responsible for providing essential services and managing the development and maintenance of infrastructure within the city (Mberi, Gumbo & Mungofa 2018). The municipality is responsible for providing services such as water supply, waste management, sanitation, road maintenance, and street lighting to the residents of Harare. It also oversees urban planning and development activities, including zoning regulations, land use management, and building control, to ensure sustainable growth and development within the city. Its responsibilities extend to collecting various taxes, rates and fees from residents and businesses to generate revenue for funding its operations and service delivery. Apart from that, the municipality plays a crucial role in public health management, including the provision of healthcare facilities, waste management and environmental protection initiatives. Finally, it is involved in providing social services such as housing, education, and recreational facilities to enhance the well-being of its residents.

One of the most significant department under the Harare Municipality is the Waste Management Department which plays a critical role of ensuring effective waste management practices within the city. According to Sithole (2020) the department is responsible for organizing and overseeing the collection and disposal of solid waste within Harare. This includes coordinating waste collection schedules, managing waste transfer stations and ensuring proper disposal methods are followed. It also promotes recycling initiatives and waste minimization practices among residents and businesses. This involves raising awareness, establishing recycling centers, and facilitating the collection and processing of recyclable materials. Robertson (2017) postulates that the department works to combat illegal dumping and littering by implementing enforcement measures, conducting awareness campaigns, and

maintaining cleanliness in public spaces. The department also oversees the operation and maintenance of landfills within Harare. This includes ensuring compliance with environmental regulations, implementing landfill gas management systems and monitoring landfill capacity. Lastly, it engages in public education and outreach programs to promote responsible waste management practices. This may involve conducting workshops, distributing educational materials, and collaborating with community organizations.

The problem of plastic waste in CBDs presents a range of problems that impact both the urban environment and its inhabitants. Eriksen et al (2014) postulates that one significant issue is the visual pollution caused by plastic litter, which detracts from the aesthetic appeal and cleanliness of CBDs, potentially affecting tourism and overall city image. Moreover, plastic waste in CBDs often ends up in storm water drains and can contribute to urban flooding during heavy rainfall, as blocked drains impede water flow (Cheshire et al, 2009). Plastic waste also poses risks to public health, as it can serve as breeding grounds for disease-carrying pests like mosquitoes and rodents. According to Pinto and Araujo (2019) the inadequate management of plastic waste in CBDs can lead to clogged drainage systems, resulting in increased maintenance costs for local authorities and potential disruptions to transportation and daily activities (Nema, 2020).

This chapter aims to cover an introduction to the study, presenting the background that sets the context for the research. It outlines the statement of the problem, identifying the specific issue or gap in knowledge that the study aims to address. The research objectives are then presented, clearly defining the goals and outcomes the study intends to achieve. To guide the investigation, research questions are formulated, highlighting the specific inquiries the study seeks to answer. Additionally, a hypothesis is proposed, stating the expected relationship or outcome that will be tested during the research. The importance of the hypothesis is discussed, emphasizing its relevance and potential contributions to the field. Research assumptions are also stated, outlining the underlying beliefs or conditions upon which the study is based. The justification for conducting the research is provided, explaining why it is necessary and valuable. Furthermore, the purpose of the study is articulated, indicating the overall intention and aim of the research. The significance of the study is then discussed, highlighting its potential impact and the benefits it may bring to various stakeholders. Delimitations are mentioned, specifying the boundaries and scope of the research, while limitations are acknowledged, acknowledging the potential constraints or obstacles that may affect the study's outcomes.

1.1 Background of the Study

Plastic waste poses a significant threat to waterways in cities worldwide, leading to blockages and environmental hazards. Plastic waste management strategies the world over focus on enforcing waste management legislation, waste management infrastructure, public awareness and recycling initiatives. Efforts have also been put on comprehensive plastic waste reduction and preventing waterway blockages. The researcher looks at the context of waste management broadly, overview of cities and local authorities in Zimbabwe, Harare local authority, analysis of the capacity of Harare City Council's to manage waste according to the Mckensy 7s model.

1.1.1 Global Waste Management

Plastic waste has become a significant environmental challenge in urban areas worldwide, including the United States (USA) where approximately 35 million tons of plastic waste are generated annually, with only a small percentage recycled (Environmental Protection Agency, 2021). Similarly, in the United Kingdom (UK) around 5 million tons of plastic waste per year, with less than half being recycled (Department of Environment, Food and Rural Affairs, 2021). Combined working together of governments, industries and the general public is working well to avert plastic waste pollution and protect water resources for future generations.

In Africa, plastic waste has emerged as a pressing environmental concern due to rudimentary infrastructure that have not been improved in a long while. In Nigeria, according to the United Nations Environment Programme (UNEP), Nigeria generates over 2 million tons of plastic waste annually, with a significant portion ending up in waterways and approximately 60% of marine litter in Nigeria is composed of plastic waste (National Bureau of Statistics, 2021). The similar case exists in South Africa it is estimated that South Africa generates around 1.7 million tons of plastic waste per year, with a considerable portion ending up in waterways and as such plastic pollution in rivers and estuaries in South Africa is a significant concern (South African Plastics Recycling Organization, 2020).

1.1.2 Overview of Cities and Local Authorities in Zimbabwe

Cities and local authorities in Zimbabwe play a crucial role in the governance and development of the country. The local government system in Zimbabwe is structured in a way that allows for the effective administration of urban areas, with cities and local authorities being responsible for the provision of basic services and infrastructure to their residents (Gupta, 2020). Zimbabwe's major cities include the capital city of Harare, Bulawayo, Mutare, and

Gweru (Mutizwa-Mangiza, 2020). These cities are centers of economic activity and are home to a significant portion of the country's population. Each city has its own local authority, which is responsible for managing the affairs of the city and ensuring the delivery of services such as water supply, sanitation, waste management, and urban planning.

In executing their roles and responsibilities, local authorities in Zimbabwe are governed by the Urban Councils Act Chapter 29:15 and the Rural District Councils Act Chapter 29:13, which outline their functions, powers, and responsibilities (Varitas, 2023). The Urban Councils Act applies to cities, municipalities, and town councils, while the Rural District Councils Act applies to rural areas. These acts provide a legal framework for the establishment, organization, and operation of local authorities and they define the roles and responsibilities of elected councilors and council officials.

Cities and local authorities in Zimbabwe face significant challenges in waste management within their jurisdictions. The rapid urbanization and population growth experienced in the country have led to increased waste generation, putting pressure on local authorities to provide efficient waste management services. Waste management in Zimbabwe is primarily the responsibility of local authorities, which are governed by the Urban Councils Act and the Rural District Councils Act. These local authorities are tasked with developing and implementing waste management policies, coordinating waste collection services, establishing waste disposal sites, promoting recycling initiatives, and educating residents on proper waste management practices (Government of Zimbabwe, 2015).

The capital city of Zimbabwe, Harare, is managed by the Harare City Council. The council is responsible for waste management within the city, including waste collection, disposal, and recycling efforts (Mbohwa, 2015). The Harare City Council faces challenges in waste management due to the growing population and limited resources. Efforts have been made to improve waste management practices in Harare, such as the establishment of recycling centers and educational campaigns to raise awareness among residents (Maposa, 2016).

Bulawayo, the second-largest city in Zimbabwe, is managed by the Bulawayo City Council. The council is responsible for waste management services in the city, including waste collection, disposal and recycling (Hoko, 2016). The Bulawayo City Council has implemented various initiatives to improve waste management, including the introduction of a pre-paid waste collection system and the establishment of recycling centers. However, financial

constraints and limited resources remain challenges in waste management in Bulawayo (Nhapi, 2014).

Mutare, a city located in the eastern part of Zimbabwe, is managed by the Mutare City Council. The council is responsible for waste management services, including waste collection, disposal, and recycling. According Mawere (2013) the Mutare City Council faces challenges in waste management, particularly in ensuring regular waste collection and proper disposal. Efforts have been made to raise public awareness about waste management practices and promote recycling initiatives in Mutare.

Gweru, a city in central Zimbabwe, is managed by the Gweru City Council. The council is responsible for waste management services in the city, including waste collection, disposal, and recycling. The Gweru City Council has faced challenges in waste management due to limited resources and inadequate infrastructure. Efforts have been made to improve waste management practices, such as the introduction of waste separation and recycling programs (Mutsau, 2018).

Cities and local authorities in Zimbabwe face significant challenges in waste management due to rapid urbanization, population growth, and limited resources. According to Mawere (2013) local authorities are responsible for developing waste management policies, coordinating waste collection services, establishing waste disposal sites, promoting recycling initiatives, and educating residents. Efforts have been made to improve waste management practices in cities such as Harare, Bulawayo, Mutare, and Gweru. However, challenges such as financial constraints, limited resources, and inadequate infrastructure continue to negatively impact waste management efforts.

1.1.3 The Harare City Council

The Harare City Council is the local authority responsible for the management and administration of the city of Harare, the capital of Zimbabwe. Harare is located in the northeastern part of the country and serves as the political, economic and cultural center of Zimbabwe. According to Mbohwa (2016) the Harare City Council is governed by the Urban Councils Act and holds the responsibility of providing various essential services to the residents of Harare, including waste management. The city of Harare is divided into various administrative districts based on location. Each suburb within the city falls under a particular district, and each district is managed by a district administrator. The districts include Dzivarasekwa, Kuwadzana, Borrowdale, Highfield, Mabvuku, Mbare, Tafara, Sunningdale,

Mufakose, and Glen View. The CBD is influenced by the whole of the Great Harare. This area encompasses Harare Urban, Harare Rural, Chitungwiza, and Epworth, has a total population of around 2.1 million people according to the 2012 Census preliminary results.

In terms of waste collection, the Harare City Council operates an old fleet of 45 collection vehicles that service different areas of the city on scheduled routes (EMA, 2023). The collection of solid waste, both household and commercial, is carried out regularly to ensure the proper removal of waste from residential and business premises. This service is essential in maintaining a clean and healthy environment within the city. The Harare City Council also focuses on waste disposal and the management of landfill sites. Landfill sites are established and managed by the council to ensure the proper disposal of waste in compliance with environmental and health standards. However, the capacity of these landfill sites is often limited, and the council faces challenges in managing waste disposal effectively (Maposa, 2016).

To address these challenges and promote sustainable waste management practices, the Harare City Council has implemented various initiatives. According to Makamba (2017). These include the establishment of recycling centers where residents can drop off recyclable materials such as paper, plastics, and glass. The council also conducts educational campaigns and community outreach programs to raise awareness among residents about waste segregation, recycling, and proper waste disposal practices. The Harare City Council plays a vital role in waste management within the city of Harare, Zimbabwe. It is responsible for coordinating waste collection services, establishing and managing landfill sites, and promoting recycling initiatives. Despite facing challenges, the council strives to ensure efficient waste management practices and raise public awareness about responsible waste disposal. Continued support and investment are crucial to achieving sustainable waste management in Harare.

1.1.4 Analysis of Harare City Council Operations

Analyzing Harare City Council's capacity to conduct its duties and responsibilities using the McKinsey 7S model provides a holistic framework to assess various interrelated elements within the organization. The McKinsey 7S model examines seven key factors namely Strategy, Structure, Systems, Skills, Staff, and Shared Values. Through the comprehensive analysis of the seven elements using the McKinsey7s model Harare City council has areas of strength and some areas that require more improvements. The analysis will help in strategic decisions and

interventions which is aimed at enhancing the council's capacity to accomplish its duties and responsibilities effectively.

1.2 Statement of the Problem

The accumulation of plastic waste in Harare's Central Business District (CBD) streets is causing severe environmental challenges, resulting in the blockage of waterways. Improper disposal practices have led to the buildup of plastic waste in water channels, leading to blockages that have far-reaching consequences. These blockages pose significant environmental hazards, including the compromised quality of water and disruption of natural water flow. Moreover, the improper disposal of plastic waste is further exacerbated by the absence of effective waste management systems and limited public awareness regarding responsible disposal practices. Despite the efforts of the Harare Municipality, the problem of plastic waste mismanagement persists, hindering effective waste management practices. The effectiveness of this infrastructure is hampered by challenges such as inadequate waste collection vehicles, limited resources, and poor maintenance (Mkhuli, 2016). According to a report by EMA (2021), Harare is a major contributor to plastic waste generation in the country, accounting for over 30% of the total plastic waste. Furthermore, the Harare City Council (2020) estimates that Harare generates approximately 1.5 million tons of plastic waste annually, with only a small portion being recycled. This mismanagement not only affects the city's infrastructure but also poses serious health risks to residents and causes damage to the local ecosystem. Therefore, this study is an investigation of the current plastic waste management practices employed by the Harare Municipality and identification of potential improvements to prevent blockages in waterways and promote sustainable waste management practices in the city.

1.3 Research Objectives

The objectives of this research were divided into main objective and secondary objectives.

Main Research Objective

To develop a framework of innovative sustainable plastic waste management strategies for the Harare Municipality.

Secondary objectives

1. To assess the current plastic waste management practices employed by the Harare Municipality in the City of Harare.

2. To examine the impact of plastic waste accumulation on waterways and the environment in City of Harare.

3. To explore the challenges and barriers faced by the Harare Municipality in effectively managing plastic waste.

4. To assess the effectiveness of existing plastic waste management policies and regulations in the City of Harare.

5. To evaluate public awareness and behavior regarding plastic waste management in the City of Harare.

6. To develop a framework of innovative waste management from potential strategies to reduce plastic waste pollution and mitigating waterway blockages in Harare CBD.

1.4 Research Questions

Main Question

Which framework of innovative sustainable plastic waste management strategies for the Harare Municipality can be effective in reducing waterway blockages?

The secondary research questions were:

1. What are the current plastic waste management practices employed by the Harare Municipality in the CBD?

2. What is the impact of plastic waste accumulation on waterways and the environment in the Harare CBD?

3. What are the challenges and barriers faced by the Harare Municipality in effectively managing plastic waste?

4. How effective are the existing plastic waste management policies and regulations in the Harare CBD?

5. What is the level of public awareness and behavior regarding plastic waste management in the Harare CBD?

1.5 Hypothesis and Propositions

The hypothesis and proposition of the study are as follows:

1.5.1 Research Hypothesis

The hypothesis for this study is as follows

H0: Innovative management of plastic waste in Harare CBD streets has a relationship with the reduction of waterway blockages.

H1: Innovative management of plastic waste in Harare CBD streets does not have a relationship with the reduction of waterway blockages.

1.5.2 Research Propositions

The following propositions are made within the context of this study

1. Effective plastic waste management strategies implemented by local authorities can significantly reduce waterway blockages, leading to improved water quality and reduced flood risks.

2. Collaborations between the local authority, informal waste staff and other stakeholder can enhance the effectiveness and sustainability of plastic waste management.

3. Tailoring plastic waste management strategies to the specific socio-economic innovative context of Harare, is crucial for success.

1.6 Importance of the Hypothesis and Propositions.

The hypothesis and proposition serves as the central idea that guides the entire research process. It provides a clear focus and direction to the study, ensuring that all research activities and data collection efforts are aligned towards testing and evaluating the hypothesis. In addition, both help in identifying the key variables that are relevant to the research question. It specifies the relationships or differences that will be examined and allows for the formulation of specific research objectives and research questions. By clearly defining these variables, the hypothesis and propositions enable researchers to develop appropriate research methodologies and measurement techniques. Furthermore, the hypothesis allows for empirical testing and evaluation of the problem at hand. Through systematic data collection and analysis, researchers can gather evidence to support or refute the hypothesis and propositions. This empirical

approach ensures that the research is based on objective observations and measurements, contributing to the scientific rigor and validity of the study's findings.

1.7 Research Assumptions

The researcher made the following assumptions:

1. The Harare Municipality has the authority and capacity to implement and enforce effective plastic waste management strategies in Harare CBD streets. This implied that the municipality has the necessary resources, infrastructure and regulatory framework to address plastic waste and prevent waterway blockages.

2. Public awareness and participation can significantly contribute to the success of plastic waste management initiatives. This implies that by raising awareness among residents about the environmental impact of plastic waste and promoting responsible waste disposal practices, there will be a positive behavioral change in the community, leading to reduced plastic waste entering waterways.

3. Collaboration and cooperation among various stakeholders, including governmental agencies, NGOs, businesses, and community members, are essential for effective plastic waste management. This implies that there is a multi-sectoral involvement and coordination in implementing comprehensive solutions to prevent waterway blockages caused by plastic waste.

4. Existing informal waste collection and recycling networks can be integrated into a formal system. It implies that integrating their knowledge, practices, and networks into a larger waste management system is feasible and beneficial.

5. Technological innovations can be adopted and adapted to the specific context of Harare CBD. It implies that adapting existing technologies or developing new ones suitable for the specific needs and resources of Harare CBD is possible and will contribute to better waste management.

6. Respondents and Interviewees gave maximum support for in terms of cooperation by answering to questions by the researcher.

1.8 Justification of the Research

The proposed study was highly justified in line with the vision of the Harare City Council to achieve a world class city status by 2025. As the city aspires to become a world-class

destination, it is essential to address the critical issue of plastic waste management in the Central Business District (CBD). The accumulation of plastic waste in the streets and its subsequent blockage of waterways not only detracts from the city's aesthetic appeal but also poses significant environmental, health, and economic challenges. By investigating the current plastic waste management practices, identifying challenges and barriers, and assessing the feasibility of proposed strategies, this study directly contributes to the realization of Harare's vision. It will provide valuable insights and evidence-based recommendations that will enable the Harare City Council to implement targeted interventions, enhance waste management systems, protect the environment, improve public health, and create a sustainable and attractive urban environment. Ultimately, by effectively addressing the issue of plastic waste in City of Harare, the city can position itself as a world-class city, attracting investments, fostering economic growth, and enhancing the overall quality of life for its residents.

1.9 Purpose of the study

The purpose of this study is to examine and propose effective strategies to manage plastic waste in local authorities, specifically focusing on the case of Harare, Zimbabwe, with the aim of reducing waterway blockages. By investigating the current practices and challenges faced by the Harare Municipality in managing plastic waste, this study seeks to identify areas of improvement and develop targeted interventions to mitigate the accumulation of plastic waste in the city's waterways. The study aims to address the pressing issue of waterway blockages caused by plastic waste, which not only poses environmental hazards but also compromises water quality and disrupts the natural flow of water. By proposing and evaluating strategies to manage plastic waste, the study intends to contribute to the preservation of the local ecosystem, protect public health, and promote sustainable waste management practices in Harare's local authorities. Ultimately, the research seeks to provide evidence-based recommendations that can guide decision-making and policy formulation towards reducing waterway blockages and creating a cleaner, healthier, and more sustainable environment in Harare towards Zimbabwe’s 2030 Vision of an upper middle income economy.

1.10 Significance of the study

This study was significant to several stakeholders that stood to benefit from the findings. According to Baimyrzaeva (2018), applied research is a type of research design that seeks to solve a specific problem or provide innovative solutions to issues affecting an individual, group or society. As such, solutions from this study was expected be of benefit to Harare

Municipality, academia and the researcher. The extent of the benefit to these stakeholders is discussed below:

1.10.1 Harare Municipality

Harare Municipality can benefit from the recommended innovative strategies if they incorporated it. Various strategies can be useful in waste management to overcome this difficult situation.

1.10.2. The Academia

This research will be an addition to the existing body of knowledge which is in the University's library for the providing knowledge on business management. It may also provide foundation from which further studies can be developed.

1.10.3. The researcher

The researcher has an interest in innovations and the general wellness in urban areas, and this research broadened the researcher's comprehension of the subject. The research aims not only at coming up with the findings that remain theoretical but to translate them into bankable practical solutions. Apart from that, the researcher's skills of conducting research will be sharpened and also obtain the MBL degree.

1.10.4 Harare Business Community

The study holds significant relevance for businesses in Harare as it addresses the issue of plastic waste management and waterway blockages. A cleaner environment can attract more customers, enhance the reputation of businesses, and contribute to a more favorable business climate. Moreover, reducing waterway blockages can help prevent flooding and other water-related issues that can disrupt business operations

1.10.5 Households in Harare

The study holds direct significance for households in Harare as it addresses the issue of plastic waste management and its impact on waterway blockages. Effective management of plastic waste can lead to cleaner streets and waterways, creating a healthier and more pleasant living environment for residents. Reduced blockages in waterways can help prevent flooding and related damages to households. Moreover, promoting responsible plastic waste disposal practices can help raise awareness among residents about the importance of environmental sustainability and resource conservation.

1.10.6 Other Cities and Towns

This study offers a roadmap for urban areas seeking to develop more comprehensive and sustainable plastic waste management strategies. By building on the foundations laid by this research, other municipalities can leverage the insights and lessons learned to tailor their own plastic pollution mitigation efforts, ultimately working towards the shared goal of reducing waterway blockages and protecting the environment. The transferability of the study's findings and proposed solutions makes it a relevant resource for local authorities across Zimbabwe and potentially in other developing countries grappling with the complex issue of urban plastic waste management.

1.11 Delimitations

The following are the delimitations of the study:

1.11.1 Geographic

The study was delimited its scope by focusing on plastic waste management practices in Harare's Central Business District (CBD) and their impact on waterways within the city boundaries. This geographical framework ensures a specific and targeted analysis of the plastic waste management situation in the CBD.

1.11.2 Period

The research was conducted over a specific period, taking into account the most recent available annual reports on waste management in Harare. The study's delimitation excludes an in-depth examination of plastic waste recovery aspects, as the primary focus was on waste management practices.

1.11.3 Conceptual

The research does not extensively analyse the environmental impact of plastic waste beyond waterways, such as soil contamination or air pollution. The economic implications of plastic waste management, such as costs and potential benefits, was not be the primary focus of the study.

1.12 Limitations

The study on the management of plastic waste in Harare CBD streets to prevent waterway blockage has certain limitations related to the research process. These limitations were acknowledged to provide a clear understanding of the potential constraints and challenges faced during the study. The limitations included:

1.12.1 Data Availability

The availability of accurate and comprehensive data related to plastic waste management in Harare CBD streets may be limited. Data collection processes, such as surveys or interviews, may face challenges due to incomplete or inconsistent records, lack of documentation, or reluctance of stakeholders to provide information. However, the researcher assured respondents that the information is granted on a condition of confidentiality and they should be as accurate as possible.

1.12.2 Sample Size and Representativeness

The study faced limitations in the sample size and representativeness of the selected participants or samples. Due to resource and time constraints, it may not be feasible to include a large and diverse sample that fully represents all relevant stakeholders. The findings may be limited to the perspectives and experiences of a subset of participants, potentially affecting the generalizability of the results.

1.12.3 Time

The limited timeframe of the research was a constraint, as it does not capture the long-term impacts of the plastic waste management strategies. To address this, incorporating regular monitoring and evaluation into the programs can also help local authorities make data-driven decisions to improve their approach and ensure the sustainability of their efforts.

1.12.4 Resource Constraints

Resource constraints, such as limited funding posed challenges in implementing conduct of the study. The researcher, to address this, worked with absolute discipline to ensure all critical aspects of the research were conducted.

1.13 Dissertation Chapters Lay-out

The layout of the chapters is as follows:

1.13.1 Chapter 1: Introduction and Background

Chapter 1 focused on introducing the study and clearly stated the direction. The chapter discussed the problem statement delineated from the background to the study. Research questions and objectives of the study were clearly articulated as well as the hypothesis statements, limitations, delimitations and significance of the study.

1.13.2 Chapter 2: Literature Review

The Chapter reviews relevant literature in the context of the expected ways of day-to-day operations of waste management giving special focus to theories under which this study is based and the conceptual framework. It also discussed the empirical evidence.

1.13.3 Chapter 3: Methodology

Chapter three looked at research methodology and research design. It discusses the research design, composition of the sample and population. The chapter also discusses different methods used in capturing, recording and transcribing, as well as ethical issues observed when analysing the collected data.

1.13.4 Chapter 4: Data Presentation, Analysis and Discussion

Chapter four presents, analyses and discusses findings of the study, a special reference given to research questions of the study.

1.13.5 Chapter 5: Conclusions and Recommendations

Chapter five summarises the study as well giving solutions to all the research questions briefly. Also, recommendations are covered in this chapter and the areas for further studies.

1.14 Chapter Summary

This chapter covered the introduction of a study focused on addressing the issue of plastic waste reduction in Harare's Central Business District (CBD) and its impact on waterway blockage. The study aims to tackle the environmental challenges caused by plastic waste in the CBD, including clogged waterways, flooding, and health hazards. The chapter provided the background and context for the research. It outlined the problem statement, research objectives, research questions, and hypothesis. The chapter emphasised the importance of the research, its purpose, and its potential significance for various stakeholders. The delimitations and limitations of the study were also discussed, defining the scope and potential constraints of the research.

Chapter II

Literature Review

2.1 Introduction

This chapter presents a comprehensive literature review on strategies to manage plastic waste to reduce waterway blockage in Harare, Zimbabwe. The literature review aims to provide a thorough understanding of the subject by examining relevant scholarly works, research studies, and theoretical frameworks. The chapter covered, the research objectives will be clearly defined, outlining the specific goals and outcomes the study aims to achieve. The chapter also provided a comprehensive definition of relevant terms, ensuring a common understanding of concepts such as waste management and waterway blockage. Furthermore, the theoretical framework will be established, presenting the theoretical perspectives and concepts that underpin the study's approach. This included an exploration of the various theories that inform and guide the research. Additionally, the chapter addresses existing research gaps in the research. Finally, the chapter discussed the research models that serve as the primary sources for data collection and analysis, providing a clear methodology for the study's investigation. The main objective of the study was to develop a framework of innovative sustainable plastic waste management strategies for the Harare Municipality.

2.2 Definition of Key Terms

The following definitions are critical to the study

1. Local Authorities: In the context of waste management, local authorities refer to the governmental bodies responsible for managing municipal affairs within a specific geographical area (United Nations Environment Programme, 2021).

2. Plastic Waste: Refers to "discarded plastic materials of any kind, including packaging, bottles, bags, and other single-use items" (National Geographic, 2023).

3. Waterway Blockages: Obstructions in rivers, streams, drainage systems, and other water bodies caused by the accumulation of waste, primarily plastic debris. These blockages can impede water flow, increase flood risk, and negatively impact aquatic ecosystems (World Wildlife Fund, 2023).

4. Strategies: Planned actions or initiatives designed to achieve a specific goal (Oxford English Dictionary, 2024). In this context, strategies refer to various approaches employed by local authorities to manage plastic waste and mitigate waterway blockages.

5. Reduce: Minimizing the generation of plastic waste through measures like promoting reusable alternatives, discouraging single-use plastics, and encouraging responsible consumption (Plastic Pollution Coalition, 2023).

6. Reuse: Utilizing existing plastic items for new purposes instead of discarding them after single use. Examples include refillable bottles, reusable shopping bags, and upcycling projects (Environmental Protection Agency, 2023).

7. Recycle: Processing used plastic waste into new materials or products, thereby diverting it from landfills and reducing reliance on virgin plastic production (Ellen MacArthur Foundation, 2023).

8. Public Awareness: Educating and informing the public about the environmental and social impacts of plastic waste, responsible disposal practices, and available solutions (United Nations Environment Programme, 2020).

9. Community Participation: Engaging residents and stakeholders in plastic waste management initiatives, such as clean-up drives, waste separation programs, and advocating for policy changes (World Bank, 2020).

10. Informal Waste Pickers: Individuals who collect and sell recyclable materials, often operating outside of formal waste management systems (International Labour Organization, 2009).

11. Formal Waste Management System: The organized infrastructure and processes implemented by local authorities to collect, transport, treat, and dispose of waste (World Health Organization, 2023).

12. Collaboration: Working together towards a shared goal. This can involve partnerships between government agencies, NGOs, private sector entities, and community groups to address plastic waste challenges (World Business Council for Sustainable Development, 2023).

2.3 Definition of Phenomenon

The phenomenon is plastic waste management in local authorities to reduce waterway blockages and encompasses the various strategies, initiatives, and interventions implemented by local authorities to address the issue of plastic waste generation and its negative impact on waterways. It involves aspects such as:

- Public awareness campaigns to educate residents about the problem and encourage responsible behavior (UNEP, 2020).
- Promoting waste reduction and recycling through policies, incentives, and infrastructure (Plastic Pollution Coalition, 2023).
- Improving waste collection systems to efficiently remove plastic waste from public spaces and ensure proper disposal (World Bank, 2020).
- Collaborating with informal waste pickers to integrate them into formal systems and improve plastic recovery (ILO, 2009).
- Developing effective regulatory frameworks such as bans on single-use plastics and extended producer responsibility schemes (WBCSD, 2023).

Ultimately, the goal is to prevent plastic waste from entering waterways, reducing blockages, improving water quality, and protecting the environment. This phenomenon is complex and multifaceted, requiring a multi-pronged approach involving various stakeholders and strategies.

2.4 Theoretical Framework

The theories provide a lens through which to analyse and understand the complex dynamics and underlying factors related to plastic waste management and waterway blockage. By incorporating these theories into the study, the researchers can gain a deeper understanding of the systems and processes involved, enabling them to propose more informed and effective strategies for managing plastic waste and preventing waterway blockages in Harare.

2.4.1 The Systems Theory

The study is underpinned by the systems and Social-Ecological Systems. Systems theory can be applied to understand the complex interactions and interdependencies within the waste

management system in Harare CBD. This theory views the waste management system as a dynamic and interconnected system comprising various components, such as waste generation, collection, disposal, and environmental impacts (Ajzen, 1991). It emphasizes the need for a holistic approach that considers the entire system and its feedback loops. Applying systems theory can help identify the key factors and relationships influencing the management of plastic waste and waterway blockage, allowing for the development of comprehensive strategies that address the system as a whole.

2.4.2 The Social-Ecological Systems (SES) framework

On the other hand, the study also adopted the Social-Ecological Systems (SES) framework which recognises the interconnectedness between social and ecological systems and their influence on sustainable resource management. In the context of the study, the framework can be used to analyze the social, economic, and environmental factors influencing plastic waste management and waterway blockage. It helps to understand the interactions between human behavior, waste management practices, and the ecological consequences. The SES framework emphasizes the importance of considering the social and ecological dimensions together when designing interventions and policies for effective plastic waste management.

2.5 Assessment of the Current Plastic Waste Management Practices

Cities and Towns in Zimbabwe face significant challenges in managing its plastic waste. According to Sibanda (2019) while the city has ambitious goals for increased recycling and reduced plastic waste, the current practices fall short of achieving these aspirations. According to United Nations Environment Programme (2020) they struggle to collect waste effectively due to insufficient resources, outdated equipment, and financial constraints. This results in uncollected waste accumulating in streets and illegal dumping sites. In addition, the city lacks a comprehensive recycling program, and formal recycling facilities are scarce. Although scavengers informally recover some recyclable materials, their activities often lack proper regulations and environmental safeguards. Furthermore, most plastic waste ends up in dumpsite, posing environmental and health risks due to inadequate management and potential leakage. Lastly, many residents lack knowledge about proper waste segregation and responsible disposal practices, hindering effective waste management.

While various city councils have aspirations for better plastic waste management, the current practices fall short. Several studies have also examined plastic waste management in African cities, highlighting both similarities and differences with Harare's situation. A study in Lagos,

Nigeria (Olusola & Idowu, 2020), identified similar problems of inadequate waste collection, limited recycling infrastructure, and public apathy towards responsible waste disposal. However, Lagos also implemented initiatives like community-based waste management and public-private partnerships, offering potential models for Harare. In contrast, a study in Curitiba, Brazil (Silva et al., 2018), showcased a successful example of a city achieving high recycling rates through extensive public education, decentralized collection points, and strong partnerships with informal waste pickers. This case highlights the potential for significant improvement in Harare's system.

The City of Harare aims to achieve a 34.1% recycling rate by 2026 and significantly reduce uncollected waste. However, current practices are not on track to meet these goals. The limited infrastructure, informal recycling, and inadequate public awareness create significant hurdles. A similar study was conducted namely a Situational Analysis of Waste Management in Harare, Zimbabwe (2018). This study highlights the city's struggles with inadequate resources, poor service delivery, and limited public awareness regarding waste management. Another study is the Municipal Solid Waste Management in Greater Harare, Zimbabwe (2015). This study emphasizes the low recycling rate and inadequate waste collection infrastructure in Harare. Lastly, there was a study called Journal of Waste Management & Recycling Technology (2022). This study suggested that implementing a multi-pronged approach, including composting, increased recycling, and improved waste collection, could significantly improve waste management in Harare.

One effective strategy for increasing plastic waste collection in cities is the utilisation of litter bags. According to Smith et al (2022) litter bags are specially designed bags that can be easily carried by individuals to collect and dispose of their plastic waste while on the go. These bags can be distributed to residents through various channels, such as community centers, schools, or local businesses, along with educational campaigns highlighting the importance of proper waste disposal. By encouraging individuals to use litter bags, cities can significantly reduce the amount of plastic waste that ends up littered in public spaces and increase the likelihood of proper disposal (Jones, 2019). This strategy not only facilitates convenient waste collection but also promotes a sense of personal responsibility among citizens towards keeping their cities clean and free of plastic pollution.

2.6 Impact of Plastic Waste Accumulation on Waterways and the Environment

Plastic waste accumulation poses a significant threat to waterways and the environment in urban areas worldwide. Studies have shown that the buildup of plastic debris in rivers, lakes, and oceans can disrupt aquatic ecosystems, harm wildlife, and contribute to the degradation of water quality (Jambeck et al., 2015; UNEP, 2018). In major cities such as Mumbai, India, plastic waste has clogged drainage systems, leading to increased flooding during monsoon seasons (Dhopatkar & Deshpande, 2020). Similarly, in Jakarta, Indonesia, plastic pollution has been linked to the exacerbation of the city's chronic flooding issues (Harahap et al., 2021).

The presence of micro plastics in waterways has also been shown to bioaccumulate in the food chain, potentially posing risks to human health (Avio et al., 2017). Studies have found high concentrations of micro plastics in various aquatic organisms, including fish and shellfish, which can ultimately make their way into the human diet (Bessa et al., 2018; Li et al., 2020). This raises concerns about the potential long-term effects of micro plastic exposure on human health, as the consequences of ingesting these small plastic particles are still being investigated (Prata et al., 2020).

Plastic waste pollution in the Harare CBD poses a significant threat to its waterways and the broader environment. Its impact extends beyond aesthetics, affecting ecological health, public health, and economic well-being. Plastic debris clogs waterways, disrupting flow and hindering oxygen exchange, harming aquatic life. According to Isangedighi (2018) micro plastics ingested by fish and other organisms enter the food chain, posing risks to human health. Studies like Micro plastics in freshwater fishes from Lake Manyame, Zimbabwe (2020) have documented micro plastic presence in local fish species (David, 2019). Plastic accumulation destroys nesting and breeding grounds for birds and other animals, impacting biodiversity. Landfill leakage and improper waste disposal contaminate soil with micro plastics, affecting its fertility and impacting food production. Stagnant water bodies polluted with plastic debris become breeding grounds for mosquitoes and other disease vectors, increasing the risk of waterborne diseases and malaria. Burning plastic releases harmful toxins and micro plastics into the air, contributing to respiratory problems and other health issues.

Plastic waste accumulation in the Harare CBD has detrimental consequences for the environment, public health, and the economy (Obot, 2018). While the city has outlined ambitious goals, there's a gap between intention and action. Addressing resource limitations, implementing efficient waste collection and recycling systems, and promoting public

awareness are crucial steps towards mitigating plastic pollution's impact. Collaborative efforts involving the government, private sector, and communities are essential to achieve a cleaner and healthier Harare. Studies across the globe have documented the detrimental effects of plastic waste on waterways and the environment. A recent study in Nairobi, Kenya (Ogutu et al., 2021) found that plastic debris significantly reduced water quality, harming aquatic life and impacting fishing communities. Similarly, research in Dhaka, Bangladesh (Alam et al., 2020) revealed increased flooding risks due to clogged drainage systems caused by plastic waste accumulation. These examples highlight the universal nature of the problem and the potential dangers plastic pollution poses to urban environments. However, there are also success stories. A study in Surabaya, Indonesia (Andrady & Neal, 2020) documented a significant reduction in plastic pollution in the Brantas River after implementing community-based waste management initiatives and improved waste collection infrastructure. This example demonstrates the potential for positive change through effective interventions.

2.7 Challenges of Harare Municipality in Managing Plastic Waste.

Municipalities across the globe face significant challenges in effectively managing the growing problem of plastic waste. One of the primary obstacles is the sheer volume of plastic waste generated in urban areas, which often overwhelms the capacity of local waste management systems (Kaza et al., 2018). In rapidly expanding cities like Jakarta, Indonesia, the influx of plastic waste from both residential and commercial sources has strained the city's infrastructure, leading to widespread illegal dumping and improper disposal (Harahap et al., 2021). Similarly, in Manila, Philippines, the lack of comprehensive waste management strategies has resulted in the accumulation of plastic debris in waterways, contributing to recurring flooding issues (Jambeck et al., 2015; Claveria & Abrigo, 2020).

Another key challenge for municipalities is the complex and diverse nature of plastic waste, which includes a wide range of materials, shapes, and sizes that require specialized handling and processing (Heidbreder et al., 2019). The presence of non-recyclable or difficult-to-recycle plastics, such as multilayer packaging and single-use items, further compounds the challenges faced by local authorities in developing effective waste management strategies (Kaza et al., 2018; UNEP, 2018). Additionally, the lack of infrastructure for sorting, collecting, and recycling plastic waste in many cities hinders the implementation of circular economy approaches, which could help mitigate the environmental impact of plastic pollution (Heidbreder et al., 2019; Claveria & Abrigo, 2020). Addressing these challenges will require a coordinated, multifaceted approach involving cooperation between local governments, the

private sector, and community stakeholders. The Harare Municipality faces several challenges in managing plastic waste, which require concerted efforts to overcome. One major challenge is the lack of adequate waste collection infrastructure and resources. The municipality struggles to provide regular waste collection services to all areas, leading to accumulation of plastic waste in public spaces and informal settlements (Alam, 2020). This challenge hampers effective waste management and contributes to environmental pollution. To address this issue, the municipality has made efforts to improve waste collection by procuring additional waste collection vehicles and increasing the number of collection points in underserved areas (Mwita, 2021). These initiatives aim to enhance waste collection efficiency and reduce the accumulation of plastic waste.

Another significant challenge is the limited recycling infrastructure and capacity within the municipality. Insufficient recycling facilities and a lack of proper waste sorting systems make it difficult to effectively recycle plastic waste (Olagoke, 2019). In response, the municipality has collaborated with private recycling companies and non-governmental organizations to establish recycling centers and promote recycling initiatives (Olagoke, 2019). These partnerships have been instrumental in developing recycling infrastructure, raising awareness about the importance of recycling, and providing training on waste sorting techniques.

Illegal dumping and littering pose additional challenges in plastic waste management. The improper disposal of plastic waste in open spaces, water bodies, and drainage systems contributes to environmental degradation and clogged drainage systems (Nyingiro (2021). To tackle this issue, the municipality has implemented awareness campaigns to educate the public about the negative impacts of illegal dumping and littering. It has also increased the enforcement of regulations and penalties for improper waste disposal (Nahar, 2020). These efforts aim to instill a sense of responsibility among residents and deter illegal dumping practices.

Relating to other studies, there are consistent findings that highlight similar challenges faced by municipalities in managing plastic waste. A study conducted in a different urban setting revealed that inadequate waste collection infrastructure and limited recycling facilities were common barriers to effective plastic waste management (Haque, 2020). Another study conducted in a different region identified illegal dumping and littering as significant challenges, echoing the findings in Harare (Neal, 2019). These findings suggest that the challenges faced

by Harare Municipality are not unique and require context-specific but broadly applicable solutions.

In terms of related topics, the integration of circular economy principles is crucial for addressing the challenges of plastic waste management. Studies on circular economy highlight the importance of reducing plastic waste through measures such as waste prevention, reuse, and recycling (Andrady, 2018). This approach aligns with the efforts needed to overcome the challenges faced by the Harare Municipality. Additionally, studies on sustainable urban planning emphasize the significance of waste management strategies in creating clean and livable cities (Ogutu, 2021). By incorporating waste management considerations into urban planning processes, the municipality can proactively address the challenges of plastic waste. One innovative strategy for increasing plastic waste collection in cities is the use of tracking technologies. Tracking technologies, such as RFID (Radio-Frequency Identification) tags or GPS (Global Positioning System) trackers, can be incorporated into plastic waste bins or containers to monitor their location and fill-level in real-time (Chen et al., 2021). By tracking these bins, waste management authorities can efficiently plan collection routes and optimize resource allocation based on the actual needs of each location. Furthermore, tracking technologies enable proactive collection and timely emptying of bins before they overflow, reducing the chances of plastic waste being left uncollected or ending up as litter (Li et al., 2020). This strategy enhances the overall efficiency and effectiveness of waste collection systems, leading to improved plastic waste management in cities.

2.8 Assessment of Existing Plastic Waste Management Policies and Regulations.

The existing plastic waste management policies and regulations play a crucial role in guiding and regulating the management of plastic waste. Assessing their adequacy requires an examination of the comprehensiveness and effectiveness of these policies and regulations in addressing the challenges associated with plastic waste management.

One important policy measure is the implementation of plastic bag bans or levies. Such measures aim to reduce the consumption and disposal of single-use plastic bags, which contribute significantly to plastic waste. Plastic bag bans have been implemented in several countries and cities worldwide, and studies have demonstrated their effectiveness in reducing plastic bag usage and waste generation (Shahnawaz, 2019). However, it is essential to ensure that these policies are effectively enforced and accompanied by alternative packaging options and public awareness campaigns to promote compliance (Sangale, 2020).

Another aspect of plastic waste management policies is the establishment of extended producer responsibility (EPR) programs. EPR places the responsibility for managing the lifecycle of plastic products on the producers, including their proper disposal and recycling. EPR policies incentivize producers to design products with recyclability in mind and support the development of recycling infrastructure. Studies have shown that well-designed EPR programs can improve plastic waste management by increasing recycling rates and reducing the environmental impact of plastic products (Ade, 2020).

In terms of consistency with other studies, research conducted in various contexts has highlighted the importance of comprehensive and integrated plastic waste management policies. A study in Kuala Lumpur, Malaysia, found that the lack of a cohesive and coordinated approach to plastic waste management has led to significant challenges in the city (Othman et al., 2019). These studies emphasize the need for a combination of measures, including plastic bag bans, EPR programs, recycling targets, and incentives for waste reduction and recycling (Brown, 2018). Consistent findings from different regions indicate that a multifaceted approach is necessary to address the complex challenges of plastic waste management effectively.

Relating to other topics, the integration of circular economy principles is highly relevant to plastic waste management policies. The transition to a circular economy, where resources are kept in use for as long as possible through recycling and reuse, is crucial for reducing plastic waste and its associated environmental impacts (Mohammed, 2019). Policies that promote the circular economy, such as those supporting the development of recycling infrastructure, encouraging product design for recyclability, and fostering collaboration among stakeholders, can contribute to more sustainable plastic waste management.

Additionally, the consideration of social and economic dimensions in plastic waste management policies is important. Studies have highlighted the need to address issues such as informal waste sector integration, job creation, and social equity in the design and implementation of plastic waste management policies (Liu, 2020). Engaging with informal waste workers, providing training and support, and incorporating their role into the formal waste management system can enhance the efficiency and inclusivity of plastic waste management efforts.

Policies and regulations

Policies and regulations play a crucial role in increasing plastic waste collection in cities. Governments can implement policies that mandate the separation and proper disposal of plastic

waste, requiring residents and businesses to participate in recycling programs (UNEP, 2018). By enforcing strict regulations, such as fines for non-compliance or incentivizing compliance through tax credits or subsidies, cities can encourage individuals and businesses to take responsibility for their plastic waste management (Wang et al., 2020). Additionally, policies can be aimed at promoting the use of eco-friendly alternatives to single-use plastics, such as biodegradable or compostable materials, reducing the overall plastic waste generated in the first place (Geyer et al., 2017). By implementing comprehensive policies and regulations, cities can create a supportive framework that fosters responsible plastic waste collection and management.

2.9 Evaluation of the Public Awareness and Behavior Regarding Plastic Waste Management

Evaluating public awareness and behavior regarding plastic waste management involves assessing the knowledge and attitudes of the public towards waste management practices, including the understanding of plastic waste and the adoption of sustainable behaviors.

Studies have shown that public awareness and knowledge regarding plastic waste management vary across different regions and populations. A survey conducted in Bangalore, India, revealed that while most residents were aware of the environmental issues associated with plastic waste, their understanding of proper disposal and recycling methods was limited (Kamath & Chikkakrishna, 2020). Research conducted in various countries has revealed that while individuals generally recognize the environmental impacts of plastic waste, their knowledge about proper waste management practices, such as recycling and reducing plastic consumption, can be limited (Dibia, 2023). This knowledge gap often results in improper disposal practices and a lack of participation in recycling programs.

Efforts to improve public awareness and behavior regarding plastic waste management include educational campaigns and initiatives that aim to inform and engage the public. These campaigns often focus on raising awareness about the environmental consequences of plastic waste, promoting proper waste disposal techniques, and encouraging sustainable behaviors such as reducing single-use plastic consumption and recycling (Wala, 2023). Additionally, the use of social media platforms and community-based approaches can enhance public engagement and knowledge dissemination.

Relating to other studies, in Nairobi, Kenya, the socioeconomic status, educational level, and access to information were significant predictors of residents' knowledge and participation in

plastic recycling programs (Njenga et al., 2020). Similarly, a cross-cultural study in the United States and Germany revealed that individual environmental attitudes, social norms, and perceived behavioral control were key determinants of people's plastic waste reduction and recycling behaviors (Heidbreder et al., 2019). Socio-demographic characteristics such as age, education level, and income can impact individuals' knowledge and adoption of sustainable waste management practices (Onwuzurike, 2023). Studies have also highlighted the role of environmental attitudes and values in shaping individuals' behavior towards plastic waste management (Scimt, 2019). Understanding these factors can inform the design and targeting of public awareness campaigns to effectively promote sustainable behaviors.

Furthermore, the topic of public awareness and behavior regarding plastic waste management intersects with broader discussions on environmental education and behavior change. Research in the field of environmental psychology emphasizes the importance of knowledge, attitudes, and social norms in driving pro-environmental behaviors (Arinze, 2023). Strategies such as providing information, fostering environmental consciousness, and facilitating social support have been identified as effective approaches to promoting sustainable waste management practices.

The influence of policy interventions on public behavior

Another related topic is the influence of policy interventions on public behavior. Studies have shown that the implementation of policies such as plastic bag bans, recycling incentives, and extended producer responsibility programs can positively impact public awareness and behavior towards plastic waste management (Bashir, 2019). These policies create a supportive environment and provide tangible incentives for individuals to adopt sustainable practices.

Public education is a vital strategy for increasing plastic waste collection in cities. By implementing comprehensive public education campaigns, cities can raise awareness about the environmental impacts of plastic waste and the importance of proper disposal and recycling (UNEP, 2021). These campaigns can utilize various channels such as social media, television, radio, and community events to reach a wide audience. Public education initiatives can provide information on the benefits of recycling, practical tips for reducing plastic waste, and guidance on how to properly sort and dispose of plastic items (Keranen et al., 2019). By improving public knowledge and understanding, cities can promote behavior change and encourage individuals to actively participate in plastic waste collection efforts, ultimately leading to a cleaner and more sustainable urban environment.

Similarly, Collaboration is a powerful strategy for increasing plastic waste collection in cities. By fostering partnerships among stakeholders, such as government entities, waste management agencies, businesses, and community organizations, cities can leverage collective efforts and resources to enhance plastic waste collection (Scheinberg et al., 2020). Collaborative initiatives can include joint awareness campaigns, shared infrastructure for waste collection and recycling, and coordinated efforts to address specific challenges or target high-impact areas (Lundquist et al., 2021). Through collaboration, cities can tap into diverse expertise and perspectives, pool resources, and implement more effective and sustainable solutions for plastic waste management. By working together, stakeholders can overcome barriers, share best practices, and create a unified approach towards increasing plastic waste collection in cities.

2.10 Development of a Framework of Innovative Sustainable Plastic Waste Management Strategies for the Harare Municipality.

The innovative plastic waste management practices offer diverse approaches to addressing the challenges posed by plastic waste. From transforming plastic into fuel or chemicals to promoting recycling, biodegradability, upcycling, deposit-refund systems, and community-based initiatives, each method contributes to reducing plastic waste, conserving resources, and promoting environmental sustainability. However, careful consideration should be given to the specific advantages, disadvantages, and contextual factors associated with each approach

2.10.1 Plastic-to-Fuel Conversion

Plastic-to-fuel conversion involves the transformation of plastic waste into usable fuels such as diesel, gasoline, or synthetic crude oil through pyrolysis or gasification processes (Olufemi, 2017). Plastic waste is heated in the absence of oxygen, breaking it down into smaller molecules that can be refined into fuel (Olagboye, 2017).

The advantages of this strategy is that plastic-to-fuel conversion offers a viable solution to reduce plastic waste that would otherwise end up in landfills or oceans (Al-Salem et al., 2017). The process generates energy-rich fuels that can be utilized as an alternative to fossil fuels, contributing to energy diversification and reducing greenhouse gas emissions (Bridgwater, 2012). By converting plastic waste into fuel, the demand for virgin fossil fuels can be reduced, preserving natural resources (Sarker et al., 2016).

However, the main disadvantage is that the process of plastic-to-fuel conversion can release air pollutants and greenhouse gases, requiring proper emission control measures to mitigate environmental impacts (Al-Salem et al., 2017).

Plastic-to-fuel conversion presents a promising method for plastic waste management by reducing waste, recovering energy, and conserving resources. However, careful attention must be given to emission control and environmental impacts.

2.10.2 Mechanical Recycling

Mechanical recycling involves the collection, sorting, and processing of plastic waste into raw materials that can be used to manufacture new plastic products. How it is carried out: Plastic waste is collected, sorted by type, cleaned, melted, and reformed into pellets or flakes that serve as feedstock for new plastic production.

The advantages of this strategy is that mechanical recycling reduces the demand for virgin plastic materials, conserving natural resources and mitigating the environmental impact of plastic production (Geyer et al., 2017). In addition, using recycled plastic as raw material requires less energy compared to manufacturing plastic from virgin materials, resulting in lower greenhouse gas emissions (Thierry et al., 2020). Furthermore, by diverting plastic waste from landfills, mechanical recycling contributes to waste reduction and promotes the circular economy (Plastics Europe, 2019).

However, the disadvantage of the strategy is that the quality of mechanically recycled plastic may be compromised due to degradation during use, contamination with non-plastic materials, or limited ability to recycle certain types of plastics (Hopewell et al., 2009).

Mechanical recycling is an effective way to manage plastic waste by conserving resources, saving energy, and reducing waste. However, challenges related to degradation and contamination should be addressed for optimal results.

2.10.3 Biodegradable Plastics

Biodegradable plastics are designed to break down naturally under specific conditions through the action of microorganisms, reducing their persistence in the environment (Liu, 2020). Biodegradable plastics are produced using materials that can be broken down by microorganisms, either through composting, anaerobic digestion, or soil burial.

Advantages of this strategy are that biodegradable plastics contribute to mitigating the environmental impact of plastic waste by breaking down into harmless substances, reducing long-term pollution (Muthu, 2017). Additionally, biodegradable plastics can be tailored to degrade under specific conditions, allowing for applications in various sectors, including

packaging, agriculture, and medical devices (Kijchavengkul et al., 2008). Furthermore, by replacing conventional plastics with biodegradable alternatives, the demand for fossil fuel-based plastic production can be reduced, conserving natural resources (Muthu, 2017).

The main disadvantage of the strategy is that biodegradable plastics require specific conditions for effective decomposition, such as industrial composting facilities or proper waste management systems. Without adequate infrastructure, their benefits may not be fully realised (Wills, 2019).

Biodegradable plastics offer a promising approach to plastic waste management by reducing environmental impact, offering versatility, and conserving resources. However, the development of appropriate infrastructure is crucial for their effective utilization.

2.10.4 Chemical Recycling

Chemical recycling involves the conversion of plastic waste into chemical building blocks or raw materials through various processes such as depolymerization, solvolysis, or hydrolysis (Rizos, 2023). According to Fatime (2020) plastic waste is chemically broken down into monomers or other chemical components that can be used as feedstock for the production of new plastics or other chemical products.

The main advantages of this strategy is that chemical recycling can process a broader range of plastic types, including mixed or contaminated plastics that are challenging to mechanically recycle (Geyer et al., 2017). Chemical recycling can also produce high-quality recycled materials with properties similar to virgin plastics, enabling their use in a wide range of applications (Papong et al., 2021). Lastly, by enabling the recycling of plastics that would otherwise be discarded, chemical recycling contributes to waste reduction and diversion from landfills (Geyer et al., 2017).

However, it has a disadvantage that chemical recycling often requires significant energy input for the breakdown of plastic polymers, which can result in higher carbon emissions compared to mechanical recycling (Papong et al., 2021).

Chemical recycling offers an innovative method for plastic waste management by expanding recycling capabilities, preserving material quality, and reducing waste. However, the energy intensity of the process should be carefully considered in terms of its environmental impact.

2.10.5 Up cycling

Up cycling involves the transformation of plastic waste into new products of higher value or quality, with improved functionality or aesthetics (Chen, 2021). Plastic waste is creatively repurposed and transformed into innovative products through design, manufacturing, and artistic processes (Zhou, 2017).

The advantages of this strategy are that upcycling adds value to plastic waste by converting it into unique, desirable, and marketable products, promoting economic opportunities and entrepreneurship (Zhao, 2017). It also minimize the need for disposal or recycling is minimized, leading to waste prevention and resource efficiency (Berge et al., 2019). Upcycling also encourages creativity, innovation, and artistic expression, fostering a positive perception of plastic waste and promoting sustainable design principles (Gwilt, 2014).

The greatest disadvantage is that upcycling often relies on manual labor and artistic skills, which may limit its scalability and applicability for large-scale plastic waste management (Berge et al., 2019).

Upcycling presents an inventive approach to plastic waste management by creating value, preventing waste, and promoting artistic expression. While its scalability may be a challenge, it offers opportunities for local entrepreneurship and sustainable design practices.

2.10.6 Deposit-Refund Systems

Deposit-refund systems involve the collection of a refundable deposit on plastic beverage containers, which is returned to consumers upon returning the empty containers for recycling (Garcia, 2021). Consumers pay a small deposit when purchasing beverages packaged in plastic containers. When they return the empty containers to designated collection points, they receive a refund of the deposit (Rerezo, 2020).

The advantages are that deposit-refund systems have been shown to achieve high recycling rates for plastic beverage containers due to the incentive provided by the refundable deposit (Stancu et al., 2021). Furthermore, by providing a financial incentive for recycling, deposit-refund systems discourage littering and promote responsible waste management behaviors (Krogerus et al., 2020). In addition, the collection and recycling of plastic beverage containers through deposit-refund systems contribute to resource conservation by reducing the demand for virgin materials (Liu et al., 2021).

The major drawback of this strategy is that the establishment and management of deposit-refund systems require significant logistical and administrative efforts, including collection infrastructure, consumer education, and coordination among stakeholders (Krogerus et al., 2020). In addition, the systems offer an effective approach to plastic waste management by incentivizing recycling, reducing litter, and conserving resources. The challenges associated with implementation should be carefully considered for successful adoption.

2.10.7 Community-Based Recycling Initiatives

Community-based recycling initiatives involve the active involvement of local communities in the collection, sorting, and recycling of plastic waste within their neighborhoods or regions (Ferronato, 2023).

How it is carried out: Communities organize and participate in waste collection drives, establish sorting facilities, and collaborate with recycling centers or local businesses for the processing of plastic waste (Dagarp, 2023).

The main advantages of this strategy are that community-based recycling initiatives foster a sense of ownership, responsibility, and empowerment among residents, leading to increased participation and awareness of plastic waste management (Gutberlet et al., 2017). It also can create employment opportunities and support local businesses involved in waste collection, sorting, and recycling activities (Rio, 2019). Lastly, by diverting plastic waste from landfills, community-based recycling initiatives contribute to waste reduction and improved environmental sustainability at the local level (DaGalio, 2020.

However, the main disadvantage is that community-based recycling initiatives may face challenges due to limited financial and logistical resources, requiring support from local governments or external organizations (Gutberlet et al., 2017).

Community-based recycling initiatives offer a participatory and localized approach to plastic waste management, promoting community engagement, economic development, and waste reduction. Adequate support and resources are essential for their successful implementation.

2.11 Research gap

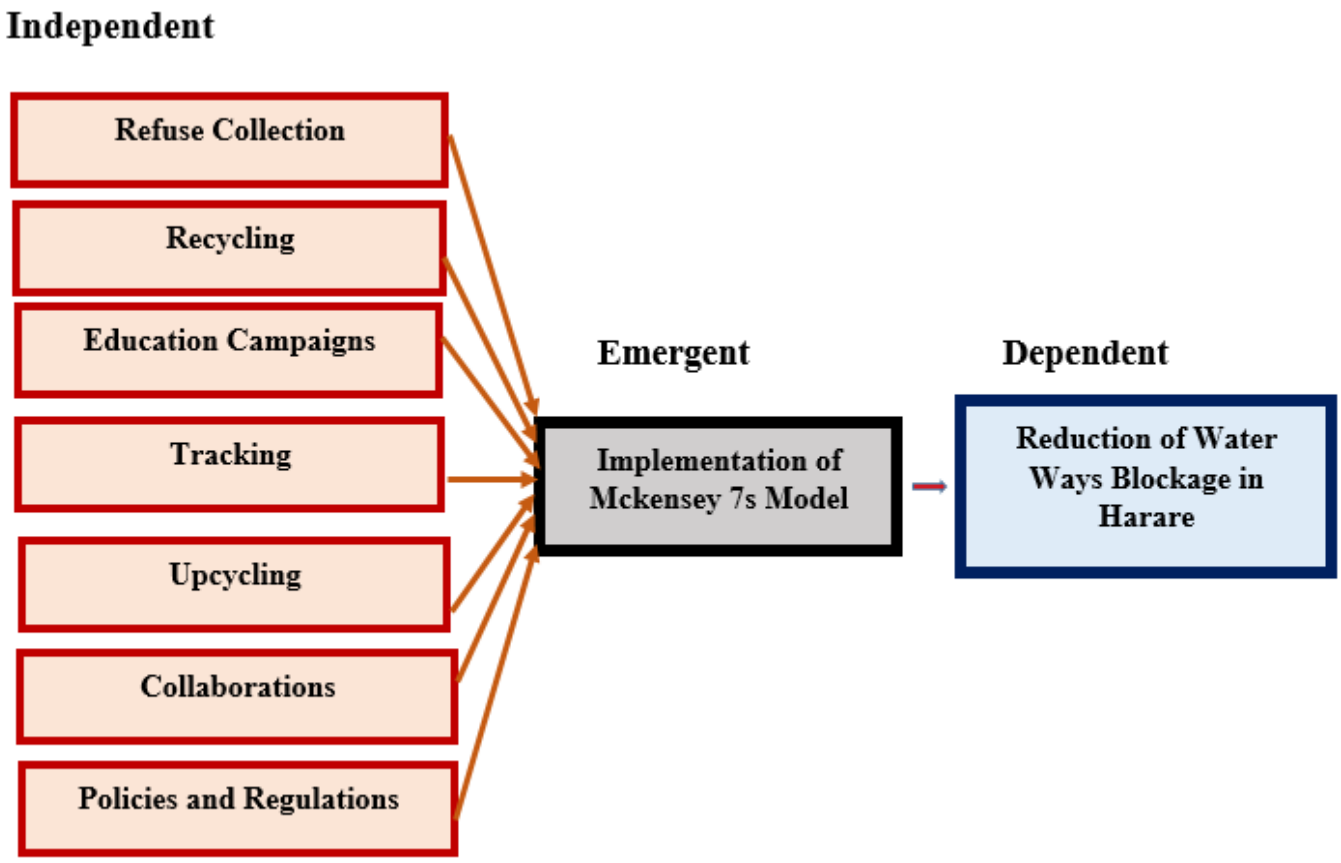
A research gap exists regarding the specific investigation of the negative effects of the COVID-19 pandemic on strategies to manage plastic waste in local authorities and reduce waterways blockage in Harare, Zimbabwe. While the study focuses on developing strategies for plastic waste management, there is a lack of subsequent research that explores the specific challenges

and implications of the COVID-19 pandemic on the implementation and effectiveness of these strategies. The pandemic has brought about significant changes in consumption patterns, waste generation, and waste management practices, including the increased use of single-use plastics and the potential disruption of waste management services. Therefore, a research gap exists in understanding how the COVID-19 pandemic has impacted the progress and outcomes of plastic waste management initiatives in Harare, and how these effects can be addressed to ensure effective and sustainable management of plastic waste in the context of the pandemic and future crises. Conducting a study to fill this research gap would provide valuable insights for policymakers and waste management practitioners to adapt and enhance strategies for managing plastic waste in local authorities amidst the challenges posed by the COVID-19 pandemic.

2.12 Conceptual Framework

The model can be formulated with the interaction of the Independent Variables, Emergent Variable and the Dependent Variable. This is shown in Fig. 2.1. below

Figure 2.1 Conceptual Framework



Source: Researcher, 2024

This model presents a comprehensive approach to addressing the issue of waterways blockage in Harare. The key idea is that by implementing a suite of independent variables, the desired outcome of reducing waterways blockage can be achieved. The independent variables include innovative refuse collection methods, recycling drives, educational campaigns to raise public awareness, initiatives to promote upcycling of waste materials, tracking systems to monitor waste management, collaborative efforts across stakeholders, and the development of enhanced policies and regulations. The underlying assumption is that these multifaceted interventions, working in tandem, will lead to more effective waste management, improved recycling and disposal practices, and ultimately, a reduction in the blockage of critical waterways in the city. By addressing the independent variables holistically, the model aims to tackle the complex and interrelated factors that contribute to the waterways blockage problem, thereby delivering the desired outcome of a cleaner, more functional water infrastructure in Harare. The success of this model will depend on the effective implementation and coordination of the various independent variables, as well as the ability to measure and evaluate the impact on the dependent variable over time.

2.13 Chapter Summary

The literature review chapter covered a thorough understanding of the subject by examining relevant scholarly works, research studies, and theoretical frameworks. The chapter looked at the research objectives will be clearly defined, outlining the specific goals and outcomes the study aims to achieve. The chapter provided a comprehensive definition of relevant terms, ensuring a common understanding of concepts such as waste management and waterway blockage. Furthermore, the theoretical framework was established, presenting the theoretical perspectives and concepts that underpin the study's approach.

Chapter III

Research Methodology

3.0 Introduction

This chapter discusses research methodology as well as explain how the study obtained and analysed data. Nayak and Singh (2015) describe research methodology as a set of principles and guidelines that determine how a study should be conducted, including the principles, procedures, and practices that govern the research. Fisher (2010) defines research methodology as the procedural framework in which a study is carried out. Zikmund (2003) explains that research methodology refers to the discussion within a research compilation that focuses on research design, data collection, sampling, fieldwork procedures, and data analysis. In this chapter, the research methodology employed is the mixed research methodology. It covers aspects such as research philosophy, approach, design, strategy, population, data collection methods, and data analysis. The chapter also addresses the validity and reliability of the study and concludes by examining various ethical considerations.

2.1 Recap of Research Objectives

In fulfillment of the study objectives, the researcher did the following:

1. Assessed the current plastic waste management practices employed by the Harare Municipality in the CBD.

2. Determined the impact of plastic waste accumulation on waterways and the environment in the Harare CBD.

3. Identified the challenges and barriers faced by the Harare Municipality in effectively managing plastic waste.

4. Assessed the effectiveness of existing plastic waste management policies and regulations in the Harare CBD.

5. Evaluated the public awareness and behavior regarding plastic waste management in the Harare CBD.

6. Assessed the feasibility and impact of the proposed strategies and interventions in reducing plastic waste pollution and mitigating waterway blockages in Harare CBD.

7. Developed a framework for innovative sustainable plastic waste management strategies for the Harare Municipality**.**

3.1 Research Philosophy

This study adopted a pragmatic research philosophy, which emphasizes the use of both quantitative and qualitative research methods to gain a comprehensive understanding of the research problem (Creswell & Creswell, 2018). This approach allowed for the triangulation of data and the exploration of multiple perspectives, enhancing the validity and reliability of the research findings.

3.2 Research Paradigm

The study is grounded in a constructivist paradigm, which acknowledges that knowledge is socially constructed and influenced by the researcher's interactions with the research participants (Guba & Lincoln, 2011). This paradigm emphasizes the importance of understanding the subjective experiences and interpretations of individuals involved in plastic waste management practices in Harare.

3.3 Research Design

The study on reducing waterways blockage in Harare employed a robust mixed-methods research design, combining both quantitative and qualitative data collection and analysis methods (Creswell & Plano Clark, 2011). This approach enabled a comprehensive investigation of the research problem, providing both numerical data and in-depth insights into the experiences and perceptions of the diverse stakeholders involved. The quantitative component of the study involved the collection of data using the close ended questionnaire. This allowed the researchers to measure the baseline conditions, track changes in the dependent

variable (reduction of waterways blockage), and identify any statistically significant relationships between the independent variables (innovative refuse collection, recycling drives, etc.) and the outcome of interest.

Complementing the quantitative data, the qualitative component of the study engaged stakeholders through in-depth interviews. This enabled the researchers to gain a deeper understanding of the contextual factors, potential barriers, and perceived effectiveness of the proposed interventions from the perspectives of key decision-makers, waste management experts, environmental advocates, and private sector representatives.

3.3 Population

The study population for this research on reducing waterways blockage in Harare consisted of 300 individuals (Creswell, 2015). This diverse population included representatives from the city's top management, the waste management department, environmental agencies, the private sector, and other relevant departments. By engaging a range of stakeholders, the researchers were able to capture diverse perspectives and gain a comprehensive understanding of the factors influencing waterways blockage in the city. The inclusion of decision-makers, waste management experts, environmental advocates, and private sector representatives ensured that the study accounted for the varied roles and concerns of different groups invested in addressing this critical urban environmental issue. This broad-based approach to the study population provided a robust foundation for developing and evaluating the proposed model for reducing waterways blockage in Harare.

3.4 Sampling

For quantitative data, random probability sampling technique, was used to select a representative sample of responses in Harare's CBD. Sample size determination will be based on statistical formulas to ensure more than 10% of the population of municipal waste management officials, environmental experts, community leaders and representatives from the private sector was selected for fair presentation and precision of the findings.

For qualitative data, purposive sampling was employed to select key informants, including municipal waste management officials, environmental experts, community leaders and representatives from the private sector. Snowball sampling was used to identify additional participants based on recommendations from initial interviewees.

3.5 Data Collection Techniques

For quantitative data respondents was presented with structured questionnaires to collect data on plastic waste generation, disposal practices, and attitudes towards waste management. On the other hand, qualitative in-depth interviews were conducted with key informants to gain insights into their experiences, perceptions, and challenges related to plastic waste management in Harare's CBD.

Pilot studies

The researcher conducted a comprehensive pilot study involving a representative sample of 50 participants from the target population, which included individuals from the city's top management, waste management department, environmental agencies, private sector, and other relevant departments. This pilot phase allowed the researcher to assess the feasibility of the proposed interventions, gauge stakeholder receptiveness, and collect preliminary data on the potential impact of the independent variables, such as innovative refuse collection, recycling drives, and enhanced policies, on the reduction of waterways blockage in Harare. The insights gained from the pilot study informed refinements to the model and facilitated the development of more robust data collection and analysis methods, ultimately strengthening the design of the full-scale implementation phase.

3.6 Data Analysis

For quantitative data, descriptive statistics and inferential statistical techniques that is chi-square tests and regression analysis, will be used to analyze quantitative data. tical software, such as SPSS, will be employed for data processing and analysis. For quantitative data thematic analysis will be used to analyze qualitative data, identifying recurring themes and patterns in the participants' responses.

3.7 Validity and Reliability

The researcher employed robust methods to ensure the validity and reliability of the study findings. A key strategy was the use of triangulation, where multiple data sources and collection techniques were leveraged to corroborate the evidence. Qualitative data was gathered through in-depth interviews with stakeholders, while quantitative data was obtained from waste management records, water infrastructure assessments, and public surveys. By crosschecking the information from these diverse sources, the researchers were able to enhance the validity of the findings, minimizing the risk of biases or errors that may have arisen from relying on a single data source.

3.7 Mixed Methods Data Integration

Data integration will be achieved through a convergent parallel design, where quantitative and qualitative findings will be analyzed separately and then compared and integrated to provide a comprehensive understanding of the research problem.

3.8 Ethical Considerations

Ethical clearance was obtained from BUSE before conducting the study. Informed consent will be sought from all research participants, ensuring their privacy and confidentiality. Ethical principles, such as respect for autonomy, beneficence, non-maleficence, and justice, was upheld throughout the research process.

By employing a mixed research approach with the aforementioned elements of philosophy, paradigm, research design, sampling, and data collection techniques, the study can gain a comprehensive understanding of the management of plastic waste in Harare CBD streets and generate valuable insights and recommendations for preventing waterway blockage.

3.9 Chapter Summary

This chapter has provided an overview of research methodology and its significance in guiding the study. The research methodology encompasses the principles, procedures, and practices that govern the research process. It is a procedural framework that determines how the study is conducted. The chapter emphasizes its importance in research design, data collection, sampling, fieldwork procedures, and data analysis. The chosen methodology for this study is a mixed research methodology, which incorporates both qualitative and quantitative approaches. The chapter has discussed various elements of the research methodology employed, including research philosophy, approach, design, strategy, population, data collection methods, and data analysis. Additionally, it has addressed the validity and reliability of the study and examined ethical considerations.

Chapter IV

Data Presentation, Analysis and Discussion

4.1 Introduction

This chapter presents the findings of the research and proceeds to examine these findings and how they address the study objectives. Specifically, it considers the feasibility of innovative sustainable plastic waste management strategies for the Harare Municipality. The analysis is grounded in the concepts which were discussed in Chapter 2, as well as primary data collected from survey participants. Conclusions and recommendations derived from this research are also based on this chapter. To facilitate clarity and comparison, the information is analyzed and presented using written text, charts, graphs, and tables.

4.2 A Discussion of the Response Rate

The study indicates that a total of 30 questionnaires were distributed to respondents, and all 30 were completed and returned, resulting in a 100% response rate. Phillis (2017) defines the response rate as the proportion of respondents to the total sample size invited to participate. Measuring the response rate is crucial for ensuring data quality, as a low response rate can introduce nonresponse bias. Similarly, the 30 scheduled interviews were all conducted. According to Wang (2018), a reasonable response rate falls within the range of 60% ± 20, and a rate below 40% is considered unacceptable due to potential validity concerns. The 100% response rate in this study indicates a high level of reliability and validity. The response rate is presented in Table 4.1.

Details	Frequency	Total Possible	Percentage
Respondents	29	30	96.67%

Table 4.1: Response Rate

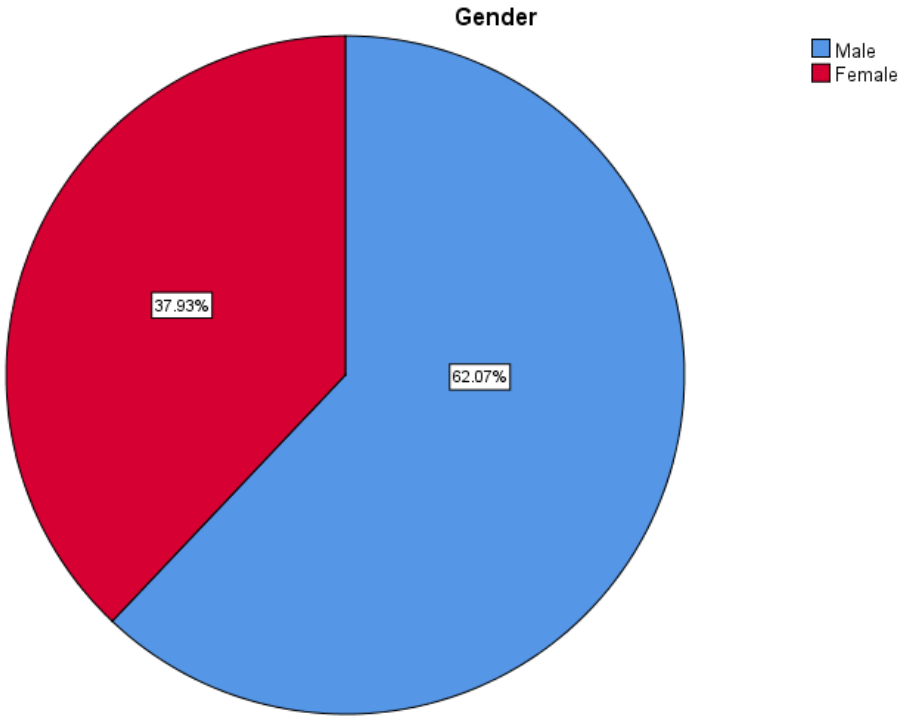
4.3 Demographic Characteristics

The demographic analysis in this study included factors like sex, age, level of education, and length of time spent in business. According to Creswell (2017), this analysis provides valuable information on how these factors influence the study's results. It helps researchers understand the characteristics of the specific group being studied and lays the groundwork for future research. Furthermore, as pointed out by Snaders (2015), studying demographic factors reveals any inequalities or differences in the data.

4.3.1 Respondents' Gender Distribution

The gender distribution of the respondents showed a higher proportion of males at 62.1% compared to females at 37.9% as shown of Figure 4.1 below. This difference is attributed to the fact that waste management activities in Harare Municipality have been male-dominated, with women often involved waste management at household level. (Banda, 2022). Additionally, the study targeted specific stakeholder groups, such as municipal officials and waste management professionals, which are generally male-dominated fields in the region (Chikumbu, 2021).

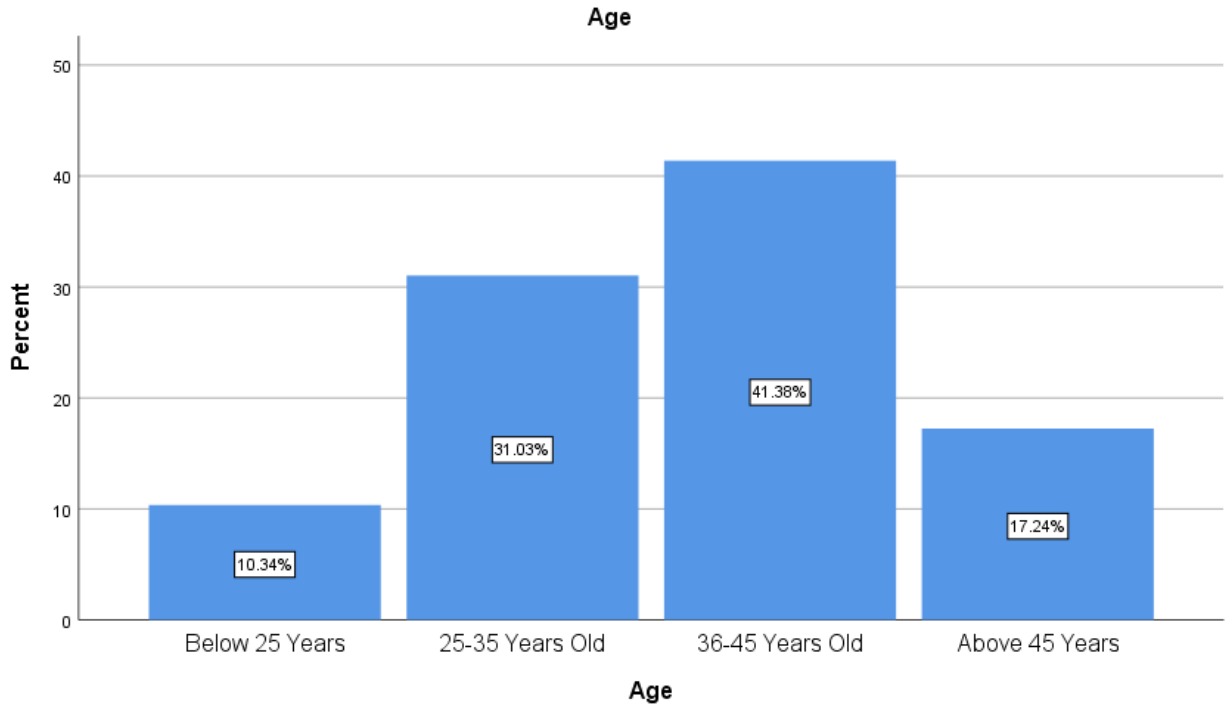
Figure 4.1 Respondents Attributes by Gender



4.3.2 Respondents Distribution by Age

The age distribution of the respondents showed a diverse range of perspectives, with 10.3% below 25 years old, 31% between 25-35 years old, 41.4% between 36-45 years old, and 17.2% above 45 years old as shown on Figure 4.2 below. This variation in age groups is critical for developing a comprehensive and inclusive framework for plastic waste management. The majority of the respondents are between 25-45 which accounted for 72.4%. These particular age groups of middle-aged respondents ensure that the perspectives of those actively involved in waste management practices are captured. It is essential to include the younger respondents since they offer insights into emerging waste management behaviours and preferences. Older respondents also provide historical context and experienced-based knowledge (Banda & Chikumbu, 2021). This diverse age distribution allows for the identification of unique needs, challenges, and priorities of different demographic groups, ultimately leading to a more holistic and effective framework for sustainable plastic waste management in the Harare Municipality.

Figure 4.2 Respondents Attributes by Age

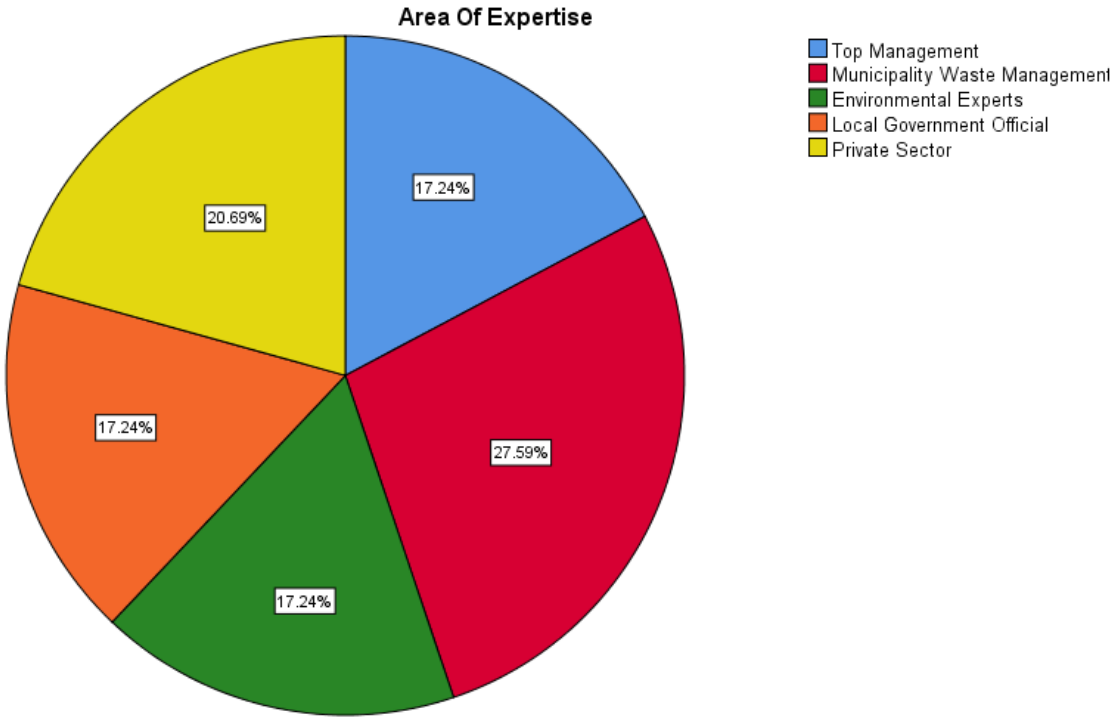


4.3.3 Attributes of Respondents by Areas of Expertise

The study included respondents from various backgrounds, such as top management (17.2%), municipal waste management (27.6%), environmental experts (17.2%), local government officials (17.2%), and the private sector (20.7%) as shown on Figure 4.3. This broad

representation ensures that the framework considers multiple perspectives and leverages the unique knowledge and experiences of different stakeholders. For instance, top management provides strategic insights, municipal waste management professionals offer operational expertise, environmental experts contribute specialised knowledge on sustainability, local government officials share policy and regulatory perspectives, and the private sector offer innovative solutions and market-based approaches. By incorporating these diverse viewpoints, the framework can address the complex and multifaceted challenges of plastic waste management in the Harare Municipality, leading to more holistic and sustainable solutions.

Figure 4.3 Attributes of Respondents by Area of Expertise



4.3.4 Attributes of Respondents by Experience

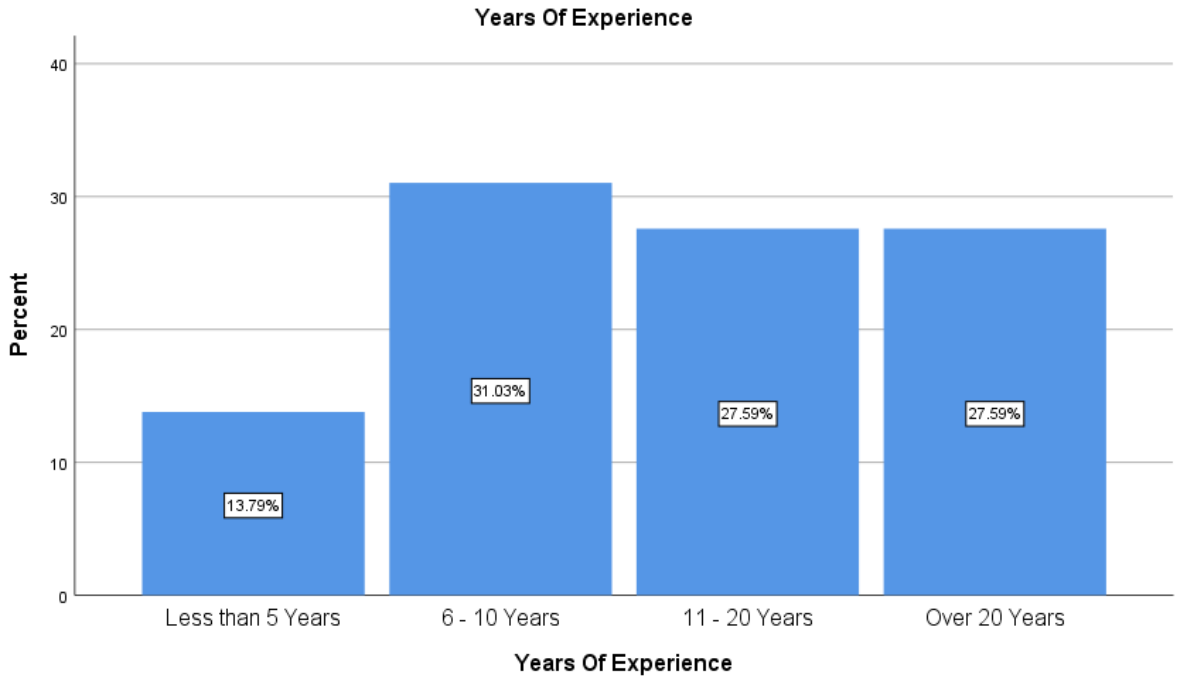


Figure 4.4 Respondents attributes by Years of Experience

This diversity of experience levels ensures that the framework incorporates both fresh perspectives and long-standing expertise in waste management as shown on Figure 4.4 above. Respondents with fewer years of experience provide insights into emerging trends, innovative approaches, and the unique challenges faced by newer entrants in the field. In contrast, those with more extensive experience offer valuable historical context, institutional knowledge, and proven strategies that have been tested over time. By blending these perspectives, the framework leverage both innovative ideas and time-tested best practices, resulting in a more robust and adaptable plan for sustainable plastic waste management in the Harare Municipality.

4.3.5 Attributes of Respondents by Educational Qualifications

The study included respondents with diplomas (6.9%), honors degrees (51.7%), master's degrees (27.6%), and PhDs (13.8%) as shown on Figure 4.5 below. This range of educational backgrounds ensures that the framework integrates both practical and theoretical knowledge, as well as varying levels of expertise. Respondents with diplomas provide insights into the operational realities and day-to-day challenges faced in waste management, while those with higher degrees can offer more strategic and research-based perspectives. The inclusion of master's and doctoral degree holders enhances the framework's technical depth and ensures that it is grounded in the latest scientific evidence and best practices. By combining these diverse educational perspectives, the framework can develop innovative and sustainable solutions that

are both practicable and evidence-based, ultimately leading to more effective plastic waste management strategies in the Harare Municipality.

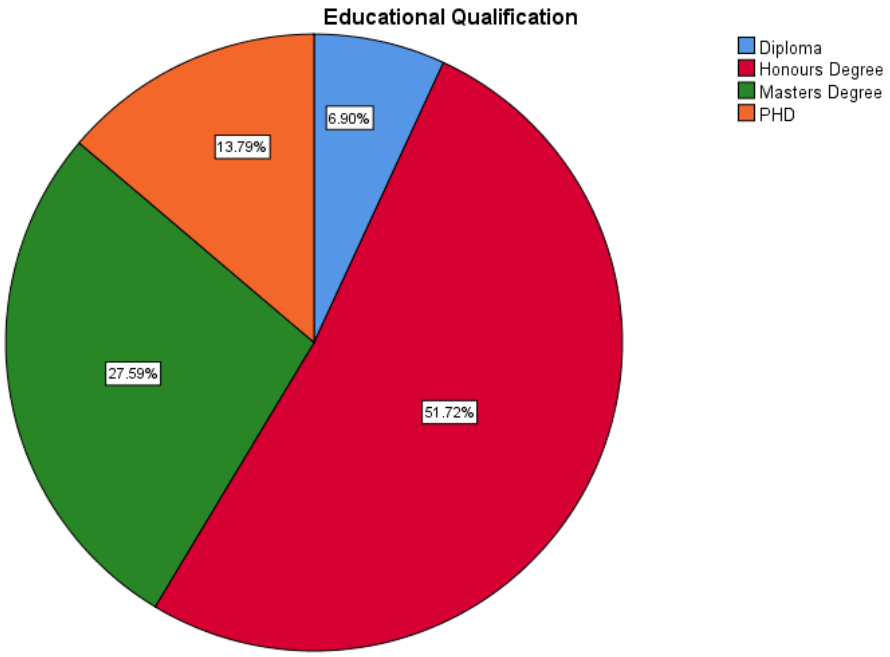


Figure 4.5 Attributes of Respondents According to Education Qualification

4.4 Descriptive Analysis

Descriptive Analysis allows the researchers to understand the diversity and representation of the stakeholder perspectives included in the framework development process (Creswell, 2017). The statistics provide a transparent and objective way to describe the composition of the respondent pool, enabling readers to assess the breadth and depth of the data collected. Furthermore, these statistics inform the researchers' interpretations and help identify any potential biases or imbalances in the sample, which is important for ensuring the framework's validity and applicability to the Harare Municipality.

Questionnaires and interviews were sent and conducted to gather data on various aspects related to waste management in the city. These aspects included the effectiveness of current waste management practices, the impact of plastic waste accumulation, the effectiveness of current waste policies, and the state of public awareness and behavior regarding waste management. The statistics collected from the respondents are presented in Table 4.2. This data provides valuable insights into the current state of waste management in the city and serves as a foundation for analyzing the challenges and opportunities for improving waste management practices.

Statistics

		Effective Of Current Waste Management	Impact Of Plastic Waste Accumulation	Effectiveness Of Current Waste Policies	Public Awareness And Behaviour
N	Valid	29	29	29	29
	Missing	0	0	0	0
Mean		1.7586	4.7241	1.5862	1.8621
Median		2.0000	5.0000	1.0000	2.0000
Std. Deviation		.57664	.45486	.73277	.74278
Maximum		3.00	5.00	3.00	3.00

Table 4.2 Statistics of Response

a. Effective of Current Waste Management

The mean score is 1.7586, which falls between "A Little Effective" (2) and "Not Effective" (1) on the Likert scale. This indicates that, on average, the respondents perceived the current waste management to be slightly more than "Not Effective" but less than "A Little Effective". The median score of 2 further corroborates this, as it suggests that the central tendency of the responses is closer to "A Little Effective" than any other category. The standard deviation of 0.57664 suggests a relatively low level of variability in the responses, meaning that the majority of the respondents had similar perceptions regarding the effectiveness of the current waste management. The maximum score of 3 indicates that the highest rating given was "Moderately Effective", but this was likely an outlier, as the mean and median values clearly indicate a more negative overall assessment. The statistics suggest that the respondents generally perceived the current waste management to be ineffective, with a relatively consistent pattern of responses across the sample.

On the other hand, on the effectiveness of the current waste management system, the sentiments expressed by interviewees aligned with the statistical findings. One interviewee mentioned that the current system did not address the management of waste enough to make the city of Harare clean. Refuse seem to pile up for days before it gets collected, and even then, I am not confident it is being handled properly. Another interviewee echoed that the system barely works and it is struggling to maintain the standard of cleanliness befitting a modern city. However, not all interviewees were entirely critical. Some noted that even though the system has its challenges, waste management is moderately effective overall. The city does make an effort to keep things clean, even if the execution could be better sometimes. The general consensus gathered from

the interviews was that the waste management system is perceived as subpar by most residents. There was room for significant improvement to the pickup schedule and waste handling procedures if this city wants to get serious about cleanliness and sustainability.

b. Impact of Plastic Waste Accumulation

The mean score of 4.7241 falls between the "Major" (4) and "Severe" (5) categories, suggesting that, on average, the respondents perceive the impact of plastic waste accumulation to be very significant. This is further supported by the median score of 5, which means that the central tendency of the responses is at the "Severe" level. The standard deviation of 0.45486 is relatively low, indicating a high level of agreement among the respondents. The maximum score of 5 also shows that a substantial portion of the respondents rated the impact as "Severe", with no scores below the "Moderate" (3) level. These statistics justify the conclusion that the respondents overwhelmingly believe that the impact of plastic waste accumulation is severe or major, with little to no dissenting opinions. This strong consensus suggests that the respondents view plastic waste as a significant environmental and societal issue that requires immediate and substantial attention and action.

In the interviews conducted, respondents consistently echoed the sentiment that plastic waste accumulation is having a severe impact on the community. The interviewees described the plastic problem as not being adequately addressed, as evidenced by waste piling up everywhere and clogging our waterways. Some stated that the situation was characterized as a major environmental and public health crisis that demands urgent action. The impact was deemed as a crisis with plastics choking ecosystems, harming goodwill, and posing real threats to human health. Respondents also felt the community was facing an environmental emergency that will only get worse if it was not addressed. The unanimous agreement among respondents, as reflected in the quantitative data, underscores the gravity of the plastic waste problem in the eyes of those most affected.

c. Effectiveness of Current Waste Policies and Regulations

The mean score of 1.5862 falls between "Not Effective" (1) and "A Little Effective" (2), indicating that, on average, the respondents view the current waste policies and regulations as ineffective or only slightly effective. The median score of 1 further reinforces this assessment, as it demonstrates that the central tendency of the responses is at the "Not Effective" level. The standard deviation of 0.73277 suggests a moderate level of variability in the responses, implying that while the majority of respondents shared a similar negative perception, there may

have been some outliers with more positive assessments. Therefore, the statistics justify the conclusion that the respondents generally believe the current waste policies and regulations to be ineffective or only marginally effective, indicating a need for significant improvements and reforms in this area to address the challenges of waste management more effectively.

In support of the quantitative findings, the qualitative data from the interviews echoed a widespread perception that the current waste policies and regulations are ineffective or only slightly effective. Respondents expressed frustration with the persistent issues of waste accumulation, improper handling, and an overall lack of effective management by the authorities. Many pointed to the visible evidence of waste piling up in streets, parks, and waterways as indicative of the system's shortcomings. Concerns were raised about the negative impact on the environment, public health, tourism, and the overall quality of life in the community. There was a general consensus that the current approaches fall short of what is needed to address the severity of the waste crisis, and that comprehensive, sustained efforts are required to enact meaningful reforms and improvements. The qualitative insights reinforce the statistical analysis, underscoring the need for significant and urgent action to rectify the deficiencies in the existing waste policies and regulations.

d. Public Awareness and Behaviours

The mean score of 1.8621 falls between "Not Enlightened" (1) and "A Little Enlightened" (2), indicating that, on average, the respondents view the public awareness and behavior regarding waste management as not very enlightened or only slightly enlightened. The median score of 2 further reinforces this assessment, as it demonstrates that the central tendency of the responses is closer to "A Little Enlightened" than any other category. The standard deviation of 0.74278 suggests a moderate level of variability in the responses, implying that while the majority of respondents shared a similar negative perception, there may have been some outliers with more positive assessments. Therefore, the statistics justify the conclusion that the respondents generally believe the public awareness and behavior regarding waste management to be lacking or only marginally enlightened, indicating a need for extensive public education and awareness campaigns to improve the situation.

The qualitative data from the interviews further substantiates the statistical findings regarding the public's lack of enlightenment on waste management. Respondents expressed concerns about the widespread apathy and ignorance among community members when it comes to proper waste disposal, recycling, and sustainable practices. Many pointed to the prevalence of

littering, improper waste sorting, and a general disregard for the environmental impact of individual behaviors. There was a sentiment that the public's awareness and engagement with waste management issues remains superficial, with little understanding of the severity of the problem or the need for more proactive, responsible actions. Respondents emphasized the urgent need for comprehensive public education campaigns to raise awareness, promote behavioral changes, and foster a greater sense of collective responsibility for addressing the waste crisis. The qualitative insights reinforce the statistical analysis, underscoring the imperative for concerted efforts to enhance the public's enlightenment and engagement with sustainable waste management practices.

e. Challenges and Barriers faced by the Harare Municipality in Effectively Managing Plastic Waste

Table 4.3 below shows statistics for challenges and barriers faced by the Harare Municipality in effectively managing plastic waste. The mean score of 4.3448 for "Lack of Collection Infrastructure" falls between "Agree" (4) and "Strongly Agree" (5) on the Likert scale, indicating that the respondents overwhelmingly believe this to be a significant challenge in waste management. The high mean score, coupled with the lack of any lower ratings, demonstrates a clear agreement among the respondents that the lack of collection infrastructure is a major obstacle in effective waste management. Similarly, the mean scores of 4.7931 for both "Financial Challenges" and "Lack of Recycling Infrastructure" suggest that the respondents strongly agree that these factors are major impediments to successful waste management. The near-unanimous agreement on the severity of these issues, as evidenced by the high mean scores, justifies the conclusion that the respondents view the lack of financial resources and recycling infrastructure as critical problems that need to be addressed.

The mean score of 4.6897 for "Illegal Dumping" also indicates a strong consensus among the respondents that this is a significant issue contributing to the challenges in waste management. The respondents appear to be in near-unanimous agreement that the prevalence of illegal dumping is a major concern that requires attention and intervention. In this light, the high mean scores across all the factors, with none falling below the "Agree" level, demonstrate a clear and consistent perception among the respondents that these issues are significant barriers to effective waste management. The statistics provided justify the conclusion that the respondents view these factors as critical and in need of urgent attention and resolution.

Statistics

		Lack Of Collection Infrastructure	Financial Challenges	Illegal Dumping	Lack Of Recycling Infrastructure
N	Valid	29	29	29	29
	Missing	0	0	0	0
Mean		4.3448	4.7931	4.6897	4.7931
Median		4.0000	5.0000	5.0000	5.0000
Std. Deviation		.48373	.41225	.47082	.49130
Maximum		5.00	5.00	5.00	5.00

Table 4.3 Challenges of Effective Plastic Waste Management

The qualitative insights from the interviews shed light on the key challenges facing effective waste management in the community. Respondents highlighted the significant gaps in collection infrastructure, noting the inadequate coverage and frequency of waste pickup services, particularly in more remote or underserved areas. This was seen as a major contributing factor to the accumulation of waste and the prevalence of illegal dumping. Financial constraints were also cited as a critical obstacle, with concerns raised about the limited budgets and resources allocated to waste management programs. This was perceived as hampering the development of more comprehensive and sustainable waste handling systems. Furthermore, the lack of robust recycling infrastructure was a significant point of frustration, as respondents expressed dismay at the limited options for proper disposal and processing of recyclable materials. This was viewed as a missed opportunity to divert waste from landfills and promote a more circular economy. Overall, the qualitative data corroborates the statistical analysis, underscoring the multifaceted nature of the waste management challenges facing the community and the need for targeted investments and systemic reforms to address these critical issues.

4.4 Factor Analysis or Reliability Tests

Cronbach's alpha is a measure of internal consistency, defined as the degree to which the items that make up the scale relate together (Pallant, 2020). The Cronbach's alpha value ranges from 0 to 1, with higher values indicating greater internal consistency. The Cronbach's alpha of 0.842 as shown on Table 4.4 reported for the survey responses indicates a high level of internal consistency among the measured items. This means that the items within the survey instrument

are highly correlated and are likely measuring the same underlying construct or concept. A Cronbach's alpha value of 0.842 is generally considered to be excellent in the social sciences, suggesting that the survey responses are trustworthy and can be reliably interpreted, as the respondents understood and answered the questions consistently, enhancing the overall validity and reliability of the data collected.

Reliability Statistics

Cronbach's Alpha	N of Items
.842	16

Table 4.4 Cronbach's Alpha

4.5 Normality Test

The normality tests provide information about whether the data follows a normal distribution, which is an important assumption for many statistical analyses. If the p-value from the Shapiro-Wilk test is greater than the chosen significance level of 0.005, then the data is normally distributed. In this study, as shown on Table 4.5 the data is not normally distributed. However, interpretation of the normality test results should be considered in the context of the research question, the sample size, and the potential impact of non-normality on the subsequent analyses. In some cases, non-normal data is analysed using alternative statistical methods which were adopted in this study.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Effective Of Current Waste Management	.352	29	.000	.742	29	.000
Impact Of Plastic Waste Accumulation	.452	29	.000	.561	29	.000
Effectiveness Of Current Waste Policies	.340	29	.000	.735	29	.000
Public Awareness And Behaviour	.229	29	.000	.806	29	.000
Lack Of Collection Infrastructure	.417	29	.000	.602	29	.000
Financial Challenges	.485	29	.000	.500	29	.000

Illegal Dumping	.435	29	.000	.584	29	.000
Lack Of Recycling Infrastructure	.491	29	.000	.480	29	.000
Innovative Refuse Collection	.452	29	.000	.561	29	.000
Recycling Drive	.437	29	.000	.605	29	.000
Educational Campaigns	.227	29	.001	.836	29	.000
Upcycling	.485	29	.000	.500	29	.000
Tracking	.473	29	.000	.524	29	.000
Collaborations	.455	29	.000	.563	29	.000
Enhenced Policies And Regulations	.455	29	.000	.567	29	.000
Effectiveness In Reducing Water Ways Blockage	.475	29	.000	.527	29	.000

a. Lilliefors Significance Correction

Table 4.5 Normality Test

4.6 Cross Tabulation Test

Cross-tabulation is a statistical method used to analyse the relationship between two or more categorical variables (Field, 2013). It involves creating a contingency table that displays the frequency of occurrence of different combinations of categories. Cross-tabulation allows researchers to examine the association between variables and identify patterns or trends in the data (Agresti, 2013). The cross-tabulation presents the distribution of respondents from different stakeholder groups based on their years of experience in waste management. The data reveals that the majority of respondents from the top management level have 11-20 years of experience, while those from the municipality waste management department have 6-10 years of experience. Environmental experts and local government officials have a mix of experience levels, with some having 11-20 years and others having over 20 years of experience. Respondents from the private sector have varying years of experience, with some having less than 5 years, 6-10 years, and over 20 years of experience. Overall, the data suggests that there is a range of experience levels among the different stakeholder groups involved in waste management. This diversity of experience can contribute to a comprehensive understanding of the challenges and opportunities in waste management and can be valuable in developing effective strategies for improving waste management practices.

Years Of Experience * Area Of Expertise Crosstabulation

Count

		Area Of Expertise					
		Top Management	Municipality Waste Management	Environmental Experts	Local Government Official	Private Sector	Total
Years Of Experience	Less than 5 Years	1	0	0	0	3	4
	6 - 10 Years	0	5	1	2	1	9
	11 - 20 Years	3	1	2	2	0	8
	Over 20 Years	1	2	2	1	2	8
Total		5	8	5	5	6	29

Table 4.6 Cross Tabulation Test

4.7 Correlation Test

A correlation test is a statistical method used to measure the strength and direction of the relationship between two variables (Creswell, 2017). It quantifies the extent to which one variable changes in relation to the other variable. This study used the Spearman's rank correlation coefficient as outlined on Table 4.7 below:

Correlations

		Innovative Refuse Collection	Recycling Drive	Educational Campaigns	Upcycling	Tracking	Collaborations	Enhenced Policies And Regulations
Innovative Refuse Collection	Pearson Correlation	1						
	Sig. (2-tailed)							
	N	29						
Recycling Drive	Pearson Correlation	.542**	1					
	Sig. (2-tailed)	.002						
	N	29	29					
Educational Campaigns	Pearson Correlation	-.005	.083	1				
	Sig. (2-tailed)	.977	.668					
	N	29	29	29				
Upcycling	Pearson Correlation	.447*	.555**	.127	1			
	Sig. (2-tailed)	.015	.002	.511				
	N	29	29	29	29			
Tracking	Pearson Correlation	.504**	.909**	-.004	.343	1		
	Sig. (2-tailed)	.005	.000	.983	.068			
	N	29	29	29	29	29		
Collaborations	Pearson Correlation	.615**	.917**	.022	.379*	.924**	1	
	Sig. (2-tailed)	.000	.000	.908	.042	.000		
	N	29	29	29	29	29	29	
Enhenced Policies And Regulations	Pearson Correlation	.587**	.954**	.070	.450*	.952**	.963**	1
	Sig. (2-tailed)	.001	.000	.717	.014	.000	.000	

N	29	29	29	29	29	29	29

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.7. Spearman Correlation Test

The positive relationships as shown on Table 4.7 above among the strategies indicate that they are mutually reinforcing and contribute to improved waste management outcomes. For instance, innovative refuse collection methods, such as smart waste bins or automated collection systems, can facilitate efficient waste collection and recycling. Recycling drives and upcycling initiatives encourage the public to actively participate in waste reduction and resource recovery. Tracking systems enable effective monitoring of waste streams and help identify areas for improvement. Collaborations among stakeholders, such as government agencies, private sector companies, and community organizations, foster a collective effort towards sustainable waste management. Enhanced policies and regulations provide a supportive framework for implementing effective waste management practices. The statistical significance of the relationships between these strategies further emphasizes their importance in achieving successful waste management outcomes. It suggests that implementing these strategies in a coordinated manner can lead to substantial improvements in waste management practices and contribute to a more sustainable and environmentally friendly waste management system.

The qualitative insights from the interviews align with the positive relationships observed among the various waste management strategies. Respondents emphasized the need for a comprehensive and integrated approach to tackle the complex waste challenges facing the community. They highlighted the potential synergies between innovative collection methods, recycling initiatives, data-driven tracking systems, collaborative partnerships, and supportive policies and regulations. For instance, the implementation of smart waste bins and automated collection was seen as a way to enhance efficiency and facilitate the segregation of recyclable materials. Community-driven recycling drives and upcycling projects were viewed as effective in raising awareness and encouraging active participation in waste reduction efforts. The use of tracking systems to monitor waste streams was described as crucial for identifying areas for improvement and informing the development of targeted interventions. Collaborative efforts involving government agencies, private businesses, and local organizations were deemed essential for leveraging resources, expertise, and community engagement towards sustainable waste management solutions. Respondents emphasized that a holistic approach, combining

these mutually reinforcing strategies, would be necessary to achieve meaningful and lasting improvements in waste management practices and outcomes.

4.8 Regression Test

Regression analysis is a statistical method used to investigate the relationship between a dependent variable and one or more independent variables (Liu, 2020). It allows researchers to predict the value of the dependent variable based on the values of the independent variables as shown on Table 4.8 below.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.767	.322		2.380	.027
	Innovative Refuse Collection	.336	.066	.299	5.124	.000
	Recycling Drive	.268	.137	.322	1.950	.065
	Educational Campaigns	.003	.023	.007	.152	.881
	Upcycling	.255	.077	-.206	-3.326	.003
	Tracking	-.162	.130	-.187	-1.243	.228
	Collaborations	1.086	.129	-1.423	-8.397	.000
	Enhanced Policies And Regulations	1.747	.206	2.064	8.493	.000

a. Dependent Variable: Effectiveness In Reducing Water Ways Blockage

Table 4.8 Regression Test

The positive relationships among the strategies indicate that they are mutually reinforcing and contribute to improved waste management outcomes. For instance, innovative refuse collection methods, such as smart waste bins or automated collection systems, can facilitate efficient waste collection and recycling. Upcycling initiatives encourage the public to actively participate in waste reduction and resource recovery. Collaborations among stakeholders, such as government agencies, private sector companies, and community organizations, foster a collective effort towards sustainable waste management. Enhanced policies and regulations provide a supportive framework for implementing effective waste management practices.

The statistical significance of the relationships between these strategies further emphasizes their importance in achieving successful waste management outcomes. It suggests that implementing these strategies in a coordinated manner can lead to substantial improvements in waste management practices and contribute to a more sustainable and environmentally friendly waste management system.

The qualitative insights gathered from the interviews align closely with the positive relationships observed among the various waste management strategies. Respondents expressed a clear understanding of the synergistic potential of these approaches and the need for a coordinated, multi-pronged effort to address the waste management challenges. They highlighted the transformative power of innovative collection methods, such as smart waste bins and automated systems, in streamlining the waste handling process and facilitating increased recycling rates. Upcycling initiatives were seen as effective in engaging the public and fostering a sense of collective responsibility toward waste reduction and resource recovery. The respondents emphasized the crucial role of collaborative partnerships, bringing together government agencies, private sector players, and community organizations, in leveraging resources, expertise, and community engagement to drive sustainable waste management solutions. Importantly, the respondents underscored the importance of enhanced policies and regulations in providing a supportive framework for the implementation of these strategies.

4.9 One-Sample t-test

A one-sample t-test is a statistical test used to determine whether the mean of a population is equal to a specified value. It compares the sample mean to the hypothesized population mean and calculates a t-statistic to assess the significance of the difference.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Effectiveness In Reducing Water Ways Blockage	29	4.7586	.51096	.09488

Table 4.9 One-Sample Statistics

One-Sample Test

	Test Value = 4					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Effectiveness In Reducing Water Ways Blockage	7.995	28	.000	.75862	.5643	.9530

Table 4.10 One-Sample Test

The mean of 4.7586 in the one-sample t-test shown on Table 4.9 above indicates the average value of the sample. The statistical significance of the mean suggests that the observed difference between the sample mean and the hypothesized population mean is unlikely to have occurred by chance alone which is 0.000 shown on table 4.10. This means that the results are reliable and provide evidence to support the research hypothesis or claim regarding the population mean. The statistical significance of the mean allows researchers to make inferences about the population based on the sample data.

4.10 ANOVA Test

Analysis of variance (ANOVA) is a statistical method used to compare the means of two or more groups Saunders (2015). It tests whether there is a statistically significant difference between the means of the groups, taking into account the variability within each group.

The ANOVA result of 7.310 with statistical significance indicates that there is a significant difference between the means of the compared groups. This means that the observed differences in the dependent variable are unlikely to have occurred by chance alone and can be attributed to the independent variable or variables being studied. The statistical significance of the ANOVA result suggests that the findings are reliable and can be used to draw meaningful conclusions about the relationship between the variables.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7.045	7	1.006	79.572	.000[b]
	Residual	.266	21	.013		
	Total	7.310	28			

a. Dependent Variable: Effectiveness In Reducing Water Ways Blockage

b. Predictors: (Constant), Enhanced Policies And Regulations, Educational Campaigns, Upcycling, Innovative Refuse Collection, Tracking, Recycling Drive, Collaborations

Table 4.11 ANOVA

4.11 Discussion of Findings

The study findings reveal that the current waste management practices in Harare are not effective, posing significant challenges for the city. This aligns with the systems theory, which emphasizes the interconnectedness of various components within a system and the need for a holistic approach to address complex problems (Von Bertalanffy, 1968). The accumulation of plastic waste in Harare is particularly severe, which can be attributed to the lack of a robust waste management infrastructure and the limited public awareness and engagement, as suggested by the social-ecological model (Bronfenbrenner, 1979).

The study further indicates that the existing waste management policies and regulations in Harare are not effective in addressing the prevailing challenges. This finding resonates with the policy implementation theory, which highlights the importance of effective policy formulation, communication, and enforcement to achieve desired outcomes (Pressman & Wildavsky, 1973). The research also reveals a concerning lack of public enlightenment regarding refuse collection, which is consistent with the diffusion of innovations theory, suggesting the need for targeted communication and educational campaigns to promote behavioural change (Rogers, 2003).

The identified challenges, including the lack of collection infrastructure, financial constraints, illegal dumping, and the absence of a robust recycling infrastructure, are consistent with the resource-based view theory (Barney, 1991). This theory emphasizes the critical role of resources and capabilities in organizational performance, underscoring the need for strategic investments and resource allocation to address the waste management challenges in Harare. The proposed strategies, such as innovative refuse collection methods, upcycling initiatives,

stakeholder collaborations, and enhanced policies and regulations, align with the systems thinking approach and the resource-based view, indicating the potential for a comprehensive and integrated solution to the waste management crisis.

4.12 Chapter Conclusion

In this chapter, the research findings related to the strategies for waste management in Harare which are summarised and discussed. The analysis of the strategies formed the basis for the researcher's conclusions and recommendations. To ensure clarity and facilitate comparison, the collected information was presented in various formats, including written text, charts, graphs, and tables. Ultimately, this chapter provided a comprehensive summary of the research outcomes, shedding light on the strategies of waste management to reduce waterway blockage in Harare.

Chapter V

Conclusions and Recommendations

5.0 Introduction

The final chapter of the study of strategies to manage plastic waste in local authorities to reduce water ways blockage focuses on the conclusions and recommendations derived from the research. This section examines how the study successfully achieved its overarching aim and specific objectives, providing a summary of the key conclusions drawn from the findings. The chapter also outlines how the research was able to comprehensively answer the guiding research questions, shedding light on the critical plastic waste management challenges facing local authorities in Harare. Additionally, this final section highlights the study's core contributions and recommendations.

5.1 Achievement of Research Aim and Objectives

The study successfully achieved its core research aim of investigating strategies that local authorities in Harare, Zimbabwe can implement to better manage plastic waste and mitigate the issue of waterway blockages. To accomplish this, the research methodically addressed a series of interrelated objectives. It successfully assessed the current plastic waste management practices employed by the Harare Municipality in the CBD before determining the significant impact that plastic waste accumulation has on the city's waterways and broader environment. The study managed to identify the key challenges and barriers faced by the local authorities in effectively managing plastic waste and evaluated the effectiveness of existing plastic waste management policies and regulations, as well as gauged public awareness and behaviour regarding waste management in the Harare CBD. Having done that, the research assessed the feasibility and potential impact of proposed strategies and interventions for reducing plastic pollution and waterway blockages. Through comprehensively addressing these research objectives, the study was able to develop a well-rounded understanding of the plastic waste issues facing Harare and put forth practical recommendations for local authorities to enhance their waste management systems.

5.2 Conclusions

The following are the conclusions of the study:

1. The current waste management practices in Harare are not effective, posing significant challenges for the city due to the failure of the waste management system.

2. The accumulation of plastic waste in Harare is particularly severe, which can be attributed to the lack of a robust waste management infrastructure and the limited public awareness and engagement and general lack of funding.

3. The existing waste management policies and regulations in Harare are not effective in addressing the prevailing challenges.

4. There is a concerning lack of public enlightenment regarding refuse collection and major part the general public is ignorant of their critical roles in waste management.

5. There is little strategic investments and resource allocation in the waste management for Harare's CBD which makes it difficult to control disposal of waste and managing it.

6. The proposed strategies of innovative refuse collection methods, upcycling initiatives, stakeholder collaborations, and enhanced policies and regulations have the potential of providing a comprehensive solution to the waste management crisis.

7. The study's findings emphasize the interconnected and holistic approach which involve all stakeholders to address the complex challenges faced by the Harare municipality.

5.3 Answer to Research Questions

This study on examined the current state of plastic waste management in CBD. The research found that the existing waste management practices employed by the Harare Municipality were largely ineffective, leading to the severe accumulation of plastic waste in the area. This accumulation had a significant impact on the local waterways, causing widespread blockages and contributing to environmental degradation. The study identified several key challenges and barriers faced by the municipality, including a lack of robust waste management infrastructure, financial constraints, ineffective policies and regulations, and limited public awareness and engagement. The research also revealed that the existing plastic waste management policies and regulations in the Harare CBD were not adequate in addressing the prevailing challenges. Furthermore, the study found that the level of public awareness and behaviour regarding plastic waste management was concerning low, underscoring the need for targeted educational campaigns and community involvement. Importantly, the research proposed a range of feasible strategies, such as innovative refuse collection methods, upcycling initiatives, stakeholder collaborations, and strengthened policies and regulations, which were deemed to have the

potential to significantly reduce plastic waste pollution and mitigate waterway blockages in the Harare CBD.

5.4 Contribution

The study had the following Theoretical, Methodological and Empirical contributions:

5.4.1 Theoretical Contribution

This study makes a significant theoretical contribution to the understanding of plastic waste management within the context of local government authorities. By adopting a systems-thinking approach, the research highlights the interconnected and holistic nature of the challenges faced by the Harare Municipality in effectively managing plastic waste. This theoretical framing emphasizes the need for a comprehensive and integrated solution that addresses the various components of the waste management system, including infrastructure, policies, stakeholder collaboration, and public engagement. The study builds upon existing theories and frameworks in the field of waste management, providing a nuanced perspective on the complex dynamics that underlie the persistent challenges in urban areas like Harare's central business district. Additionally, the research contributes to the theoretical development of sustainable waste management practices, particularly in the context of developing countries, where resource constraints and infrastructure deficiencies pose unique challenges.

5.4.2 Methodological Contribution

The study employed a combination of qualitative and quantitative methods, including interviews and surveys to gather data from a diverse range of stakeholders, including government officials, waste management workers, and members of the public. This methodological triangulation allowed the researchers to obtain a comprehensive understanding of the issue, capturing both the subjective experiences and objective data points related to plastic waste management in Harare's CBD. Furthermore, the study's use of geospatial analysis and mapping techniques to assess the impact of plastic waste accumulation on local waterways and the environment demonstrates the integration of innovative methodological approaches. This methodological rigor contributes to the overall credibility and transferability of the research findings, providing a robust foundation for the development of effective waste management strategies.

5.4.3 Empirical Contribution

The empirical findings of the study on offer valuable insights that expand the existing knowledge base on plastic waste management in urban settings, particularly in the context of developing countries. The study provides a detailed assessment of the current plastic waste management practices employed by the Harare Municipality, highlighting the significant challenges and barriers that hinder effective waste management. The empirical evidence gathered through the research illuminates the far-reaching impacts of plastic waste accumulation on local waterways and the environment, underscoring the urgency for actionable solutions. Furthermore, the study's examination of the existing policies and regulations, as well as the level of public awareness and behaviour, offers a nuanced understanding of the systemic factors that contribute to the waste management crisis. Importantly, the empirical findings inform the development of feasible strategies and interventions, which have the potential to significantly reduce plastic waste pollution and mitigate waterway blockages in the Harare CBD, with implications for similar urban contexts.

5.5 Recommendation

The study makes the following recommendations in terms of policy, management activities and the overall multi-faceted benefits to rate payers, government sector, EMA and plastic making companies.

5.5.1 Policy Recommendations

1. Investment in the development of a robust waste management infrastructure, including improved collection, transportation, and disposal facilities, to effectively manage the severe accumulation of plastic waste in the city.

2. Review and revision of the existing waste management policies and regulations to ensure they are effective in addressing the prevailing challenges. This should include strengthening policy formulation, communication, and enforcement mechanisms.

3. Encouragement and support of the implementation of innovative strategies, such as improved refuse collection methods, upcycling initiatives, and stakeholder collaborations, to provide a comprehensive and integrated solution to the waste management crisis.

5.5.2 Managerial Recommendation

The managerial recommendations proposed are hugely based on the availability of financial resources at City of Harare. Therefore, over and above this framework, the financial

management aspect of the authority is indispensable. The study makes the following managerial recommendations:

1. Implementation of a comprehensive overhaul of the waste management system in Harare to address the ineffective current practices. This should involve a holistic approach that considers the interconnectedness of the various components within the system.

2. Increase of funding and resource allocation for the waste management sector in Harare, particularly targeting the central business district (CBD), to enhance the city's capabilities in waste control and management.

3. Implementation of targeted public awareness and educational campaigns to enlighten the general public on their critical roles and responsibilities in proper waste management practices. This should aim to promote behavioural change and increase community engagement.

4. Adoption of a systems thinking approach that involves all relevant stakeholders, including the government, private sector, and community, to address the complex challenges faced by the Harare municipality in a holistic and collaborative manner.

5.5.3 Benefits of the framework to Stakeholders

The researcher identified potential benefits of the framework to rate payers, government sector, EMA and plastic making companies. The framework provides a systematic approach to addressing the issue of plastic waste management and waterway blockages, which is crucial for local authorities like the City of Harare. It outlines strategies and interventions that can be implemented to improve plastic waste collection, recycling, and disposal, thereby reducing the burden on local waterways and infrastructure. This information can empower local decision-makers to develop and implement effective policies and programs to tackle the problem.

5.5.3.1 Rate Payers

The strategies and interventions if implemented, effectively by the local authorities, can lead to improved plastic waste management and reduced waterway blockages. This has a direct positive impact on ratepayers by reducing the incidence of flooding, property damage, and disruptions to essential services caused by blocked waterways. Additionally, it contributes to a cleaner and healthier environment for the community, which is ultimately beneficial for ratepayers. In supporting the implementation of this framework, ratepayers can play a role in addressing a critical environmental issue and enhancing the overall liveability of their community.

5.5.3.2 Government Sector

The framework provides a comprehensive approach which aligns with the government's broader environmental and infrastructure development goals. Through the strategies, the government can demonstrate its commitment to sustainable waste management practices and the protection of natural resources. It informs the development of national-level regulations, guidelines, and funding mechanisms to support local authorities in effectively managing plastic waste and mitigating its impact on the environment and public infrastructure. Overall, the framework can serve as a valuable resource for the government in its efforts to promote sustainable development and environmental conservation at the local and national levels.

5.5.3.3 EMA

To EMA, it aligns with its mandate to promote sustainable waste management practices and protect the country's natural resources. By adopting and promoting the use of this framework, the EMA can provide guidance and support to local authorities, ensuring the effective implementation of the proposed strategies and monitoring their impact on the environment. It also informs EMA's own regulatory efforts, enabling the agency to develop more comprehensive and effective policies and regulations to mitigate the environmental and public health risks associated with plastic waste.

5.5.3.4 Plastic Making Companies

The strategies focus on improving plastic waste management and promoting recycling can present opportunities for plastic making companies to engage with local authorities and develop strategies to enhance the collection, sorting, and reuse of plastic waste. Through aligning their business practices with the framework's recommendations, plastic making companies can demonstrate a commitment to sustainability and environmental responsibility, which can improve their public image and build trust with local communities.

5.6 Generalisation of Findings

The study presents findings that can be generalized to other urban centres, particularly in developing countries, that face similar challenges in effectively managing plastic waste and mitigating its impact on waterways and the environment. One key aspect of the study's findings that can be generalized is the identification of the common challenges and barriers faced by local authorities in implementing effective plastic waste management practices. The research highlights issues such as a lack of robust waste management infrastructure, financial constraints, ineffective policies and regulations, and limited public awareness and engagement,

which are prevalent in many urban areas across the developing world. These systemic challenges transcend the specific context of Harare's central business district and serve as critical barriers to sustainable waste management in similar settings.

Moreover, the study's examination of the far-reaching impacts of plastic waste accumulation on local waterways and the environment can be broadly applicable to other urban centres that share comparable geographical and ecological characteristics. The empirical evidence gathered through the research on the disruption of water systems and the contribution to environmental degradation can inform the understanding of these issues in analogous urban contexts. Additionally, the study's proposed strategies and interventions, such as innovative refuse collection methods, upcycling initiatives, stakeholder collaborations, and strengthened policies and regulations, can provide a valuable framework for developing and implementing tailored solutions in other urban areas facing similar plastic waste management challenges. The feasibility and potential impact of these strategies, as assessed in the study, can serve as a starting point for adaptation and implementation in different localities.

5.7 Research Limitations

One primary limitation of this study is the potential for biases or uneven representation among the different stakeholder groups. The study may not have captured the full range of perspectives and experiences, as the sample size or selection process for each stakeholder group may have been uneven. Additionally, the responses from top-level management or influential decision-makers may have carried more weight in the analysis, potentially overshadowing the insights from other groups. This could limit the study's ability to fully reflect the diverse experiences and concerns of all affected parties, potentially undermining the framework's applicability and effectiveness across different stakeholder groups.

5.8 Areas of Further Research

A comparative study can be conducted to analyse the plastic waste management strategies and their effectiveness across different urban centres in developing countries. This could involve examining the policies, infrastructure, stakeholder engagement, and community participation in cities facing similar challenges, for instance in other sub-Saharan African countries. Such a comparative analysis could reveal best practices, context-specific innovations, and lessons learned that could inform the development of more comprehensive and transferable waste management solutions.

5.9 Chapter Summary

The study on concluded with a comprehensive synthesis of the research findings and key recommendations. It examined how the study successfully achieved its overarching aim and specific objectives, providing a concise summary of the critical conclusions drawn from the data. The research was able to thoroughly address the guiding research questions, shedding light on the pressing plastic waste management challenges confronting local authorities in Harare's central business district. Moreover, the chapter highlighted the study's core contributions to the understanding of plastic pollution mitigation strategies in urban settings, particularly within the context of developing countries. The final section of the chapter outlined a series of recommendations to enhance the effectiveness and sustainability of plastic waste management interventions, suggesting avenues for future research to build upon the foundations laid by this study.

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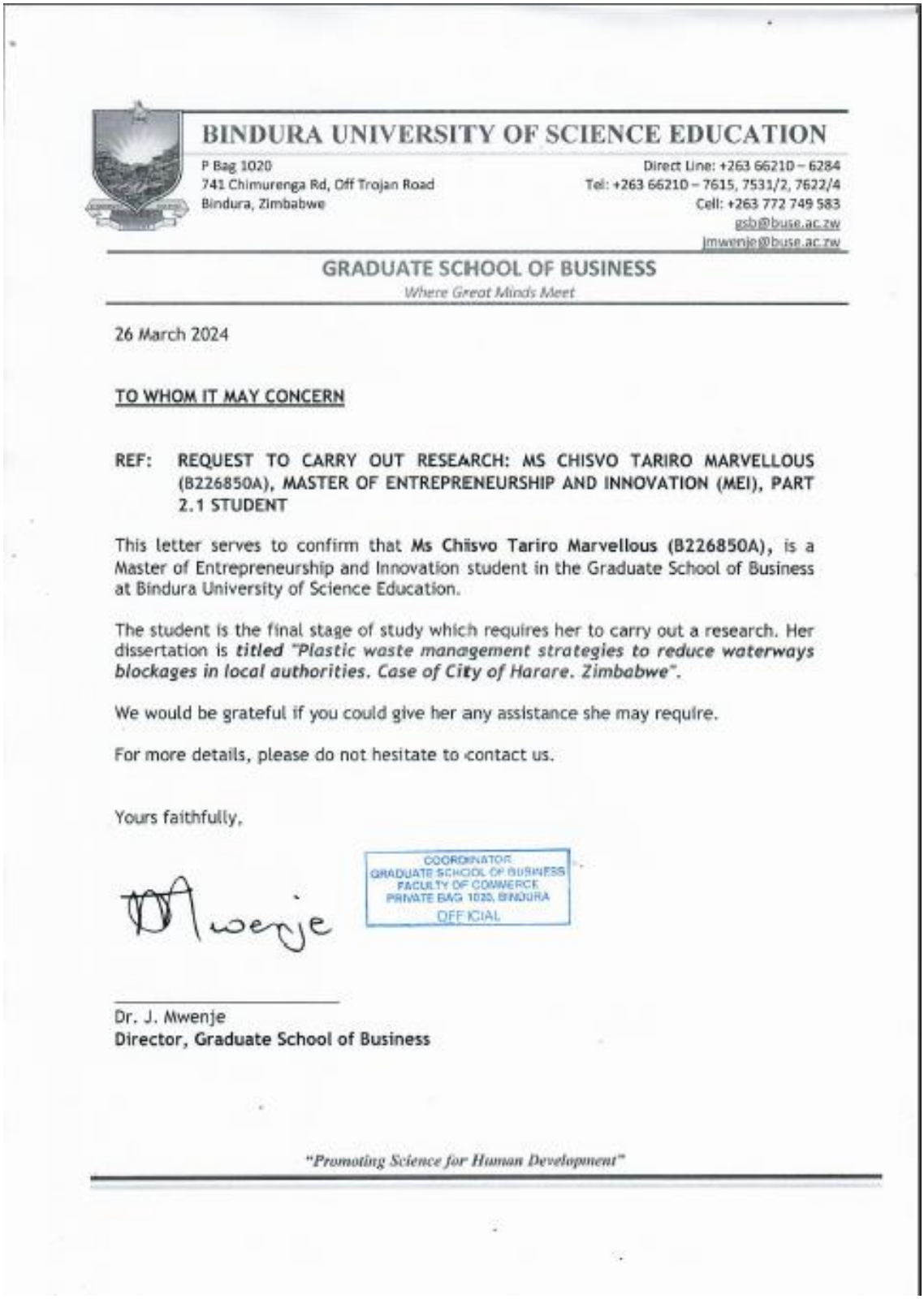
Appendix A: Cover letter



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GRADUATE SCHOOL OF BUSINESS

Where Great Minds Meet

26 March 2024

TO WHOM IT MAY CONCERN

REF: REQUEST TO CARRY OUT RESEARCH: MS CHISVO TARIRO MARVELLOUS (B226850A), MASTER OF ENTREPRENEURSHIP AND INNOVATION (MEI), PART 2.1 STUDENT

This letter serves to confirm that **Ms Chisvo Tariro Marvellous (B226850A),** is a Master of Entrepreneurship and Innovation student in the Graduate School of Business at Bindura University of Science Education.

The student is the final stage of study which requires her to carry out a research. Her dissertation is ***titled "Plastic waste management strategies to reduce waterways blockages in local authorities. Case of City of Harare. Zimbabwe".***

We would be grateful if you could give her any assistance she may require.

For more details, please do not hesitate to contact us.

Yours faithfully,

COORDINATOR
GRADUATE SCHOOL OF BUSINESS
FACULTY OF COMMERCE
PRIVATE BAG 1020, BINDURA
OFFICIAL

Dr. J. Mwenje
Director, Graduate School of Business

"Promoting Science for Human Development"

Appendix B: LETTER OF REQUEST TO DISTRIBUTE QUESTIONNAIRE

Bindura University of Science Education

P Bag 704 Chimurenga Road

Bindura

Dear Sir/Madam

RE: LETTER OF REQUEST TO DISTRIBUTE QUESTIONNAIRE

My name is Tariro Marvellous Chisvo and I am pursuing a Master of Science in Entrepreneurship and Innovation Degree with Bindura University of Science Education. I am carrying out a research on the "Plastic waste management strategies to reduce water ways blockage in local authorities: A case of City of Harare, Zimbabwe".

The information obtained will be treated with utmost confidentiality and will be used for educational purposes only. Your name or identity should not appear anywhere on this questionnaire. I request you to kindly fill in this questionnaire and help me to fulfil the course requirements.

Yours faithfully

Tariro Marvellous Chisvo

Appendix C: Questionnaire

SECTION A: DEMOGRAPHIC DATA

Please indicate your response by ticking the correct answer in the bracket.

1. **Gender:** Male [ ]
   Female [ ]

2. **Age**: Below 25 Years [ ]
   25- 35 Years [ ]
   36-45 Years [ ]
   Above 45 Years [ ]

3. **Respective Area:**

Top management	[ ]
Municipal Waste Management	[ ]
Environmental Experts	[ ]
Local Government Officials	[ ]
Private Sector	[ ]

4. Number of years of Experience in respective area

Less than 5 year [ ] Between 6-10 years [ ]

11- 20 years [ ] More than 20 years [ ]

5. Please indicate your highest level of Educational Qualification achieved;

Diploma [ ] Degree [ ] Masters [ ] PHD [ ] Other (*please specify*)……..

SECTION B: EFFECTIVENESS OF CURRENT WASTE MANAGEMENT PRACTICES EMPLOYED BY THE HARARE MUNICIPALITY

6. Tick your response on whether you think the current plastic waste management practices

employed by the Harare Municipality are effective.

Level of Effectiveness	**Score**	**Tick your response**
Highly Effective	5	
Effective	4	
Moderately Effective	3	
A Little Effective	2	
Not Effective	1	

SECTION C: IMPACT OF PLASTIC WASTE ACCUMULATION ON WATERWAYS AND ENVIRONMENT IN HARARE CBD

7. Tick your response on whether you think there is an impact in plastic waste accumulation on waterways and environment in Harare CBD.

Level of Impact	**Score**	**Tick your response**
Severe	5	
Major	4	
Moderate	3	
Minor	2	
Insignificant	1	

SECTION D: CHALLENGES AND BARRIERS FACED BY THE HARARE MUNICIPALITY IN EFFECTIVELY MANAGING PLASTIC WASTE

8. Tick your response on whether the following challenges affect Harare Municipality in effectively managing plastic waste.

SA=Strongly Agree **A**=Agree **N**=Neutral **DA**=Disagree **SD=**Strongly Disagree

Challenges	SA	A	N	DA	SD
Lack of Waste Collection Infrastructure					
Financial Challenges					
Illegal Dumping					
Lack of Recycling Infrastructure					

SECTION E: EFFECTIVENESS OF CURRENT WASTE MANAGEMENT POLICIES AND REGULATIONS

9. Tick your response on whether you think the current plastic waste management policies and regulations

Level of Effectiveness	Score	Tick your response
Highly Effective	5	
Effective	4	
Moderately Effective	3	
A Little Effective	2	
Not Effective	1	

SECTION F: PUBLIC AWARENESS AND BEHAVIOUR REGARDING PLASTIC WASTE MANAGEMENT IN HARARE CBD

10. Tick your response on what you think regarding the level of public awareness and behaviour on plastic waste management in Harare CBD

Level of Awareness	Score	Tick your response
Highly Enlightened	5	
Enlightened	4	

Moderately Enlightened	3
Somewhat Enlightened	2
Not Enlightened	1

SECTION G: THE IMPACT OF ADOPTION AND IMPLEMENTATION OF STRATEGIES IN REDUCING PLASTIC WASTE POLLUTION AND MITIGATING WATERWAY BLOCKAGES IN HARARE CBD

11. Tick your response on the effectiveness of adopting and implementing of the following strategies in reducing plastic waste pollution and mitigating waterway blockages in Harare CBD

SA=Strongly Agree **A**=Agree **N**=Neutral **DA**=Disagree **SD=**Strongly Disagree

Strategy	**SA**	**A**	**N**	**DA**	**SD**
Refuse Collection					
Recycling					
Education Campaigns					
Upcycling					
Tracking					
Collaborations					
Policies and Regulations					

12. In your opinion can you say the proposed components would effectively reduce plastic waste pollution and mitigate waterway blockages in Harare CBD

Level of Effectiveness	**Score**	**Tick your response**
Highly Effective	5	
Effective	4	

Moderately Effective	3
A Little Effective	2
Not Effective	1

THANK YOU FOR YOUR PARTICIPATION

Appendix D: INTERVIEW GUIDE

SECTION A: DEMOGRAPHIC DATA

Please indicate your response by ticking the correct answer in the bracket.

1. **Gender:** Male [ ]
   Female [ ]

2. **Age**: **Appendix B: INTERVIEW GUIDE**

SECTION A: DEMOGRAPHIC DATA

Please indicate your response by ticking the correct answer in the bracket.

1. **Gender:** Male [ ]
   Female [ ]

2. **Age**: Below 25 Years [ ]
   25- 35 Years [ ]
   36-45 Years [ ]
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Local Government Officials [ ]
Private Sector [ ]

4. Number of years of Experience in respective area

Less than 5 year [ ] Between 6-10 years [ ]

11- 20 years [ ] More than 20 years [ ]

5. Please indicate your highest level of Educational Qualification achieved;

Diploma [ ] Degree [ ] Masters [ ] PHD [ ] other (*please specify*)……..

SECTION B: EFFECTIVENESS OF CURRENT WASTE MANAGEMENT PRACTIC ES EMPLOYED BY THE HARARE MUNICIPALITY

6. What is the current effectiveness of the waste management practices employed by the Harare Municipality? What are the key strengths and weaknesses of the existing practices?

SECTION C: IMPACT OF PLASTIC WASTE ACCUMULATION ON WATERWAYS AND ENVIRONMENT IN HARARE CBD

7. How significant is the impact of plastic waste accumulation on the waterways and overall environment within Harare's central business district (CBD)?

SECTION D: CHALLENGES AND BARRIERS FACED BY THE HARARE MUNICIPALITY IN EFFECTIVELY MANAGING PLASTIC WASTE

8. What are the main challenges and barriers faced by the Harare Municipality in effectively managing plastic waste across the city and what factors contribute to these challenges?

SECTION E: EFFECTIVENESS OF CURRENT WASTE MANAGEMENT POLICIES AND REGULATIONS

9. How effective are the current waste management policies and regulations in place? Are there any gaps or areas that need to be strengthened?

SECTION F: PUBLIC AWARENESS AND BEHAVIOUR REGARDING PLASTIC WASTE MANAGEMENT IN HARARE CBD

10. What is the level of public awareness and behavior regarding plastic waste management in Harare's CBD? How engaged are citizens in waste reduction efforts?

SECTION G: THE IMPACT OF ADOPTION AND IMPLEMENTATION OF STRATEGIES IN REDUCING PLASTIC WASTE POLLUTION AND MITIGATING WATERWAY BLOCKAGES IN HARARE CBD

11. If new strategies and initiatives were adopted and implemented to reduce plastic waste pollution and mitigate waterway blockages, what kind of impact do you anticipate this would have in Harare's CBD? What would be the key benefits?

THANK YOU FOR YOUR PARTICIPATION

,, ,L S Below 25 Years [ ]

25- 35 Years [ ]

36-45 Years [ ]

S Above 45 Years [ ]

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Top management [ ]

Municipal Waste Management [ ]

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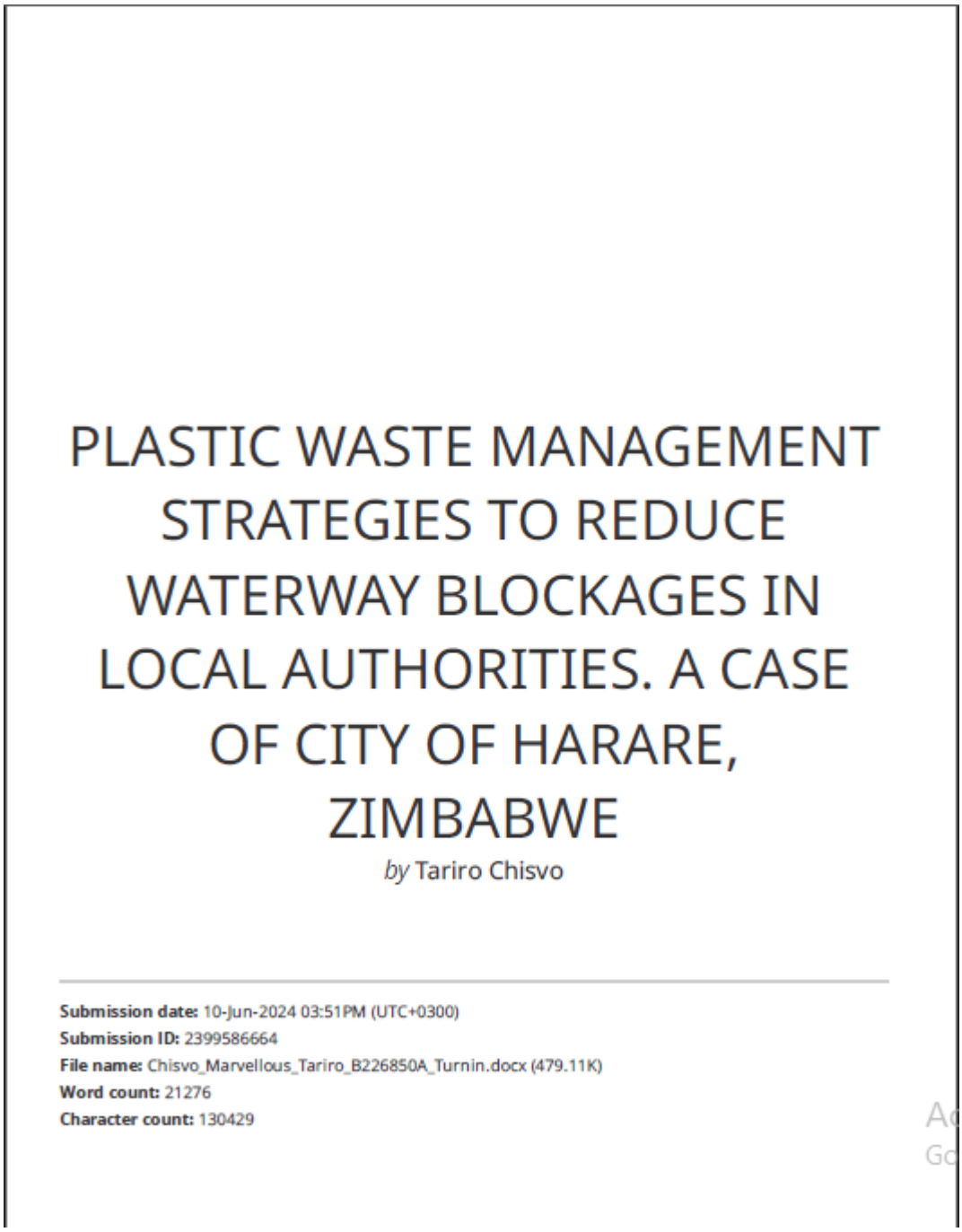
THANK YOU FOR YOUR PARTICIPATION

Appendix E Turnitin Report



PLASTIC WASTE MANAGEMENT STRATEGIES TO REDUCE WATERWAY BLOCKAGES IN LOCAL AUTHORITIES. A CASE OF CITY OF HARARE, ZIMBABWE

by Tariro Chisvo

Submission date: 10-Jun-2024 03:51PM (UTC+0300)
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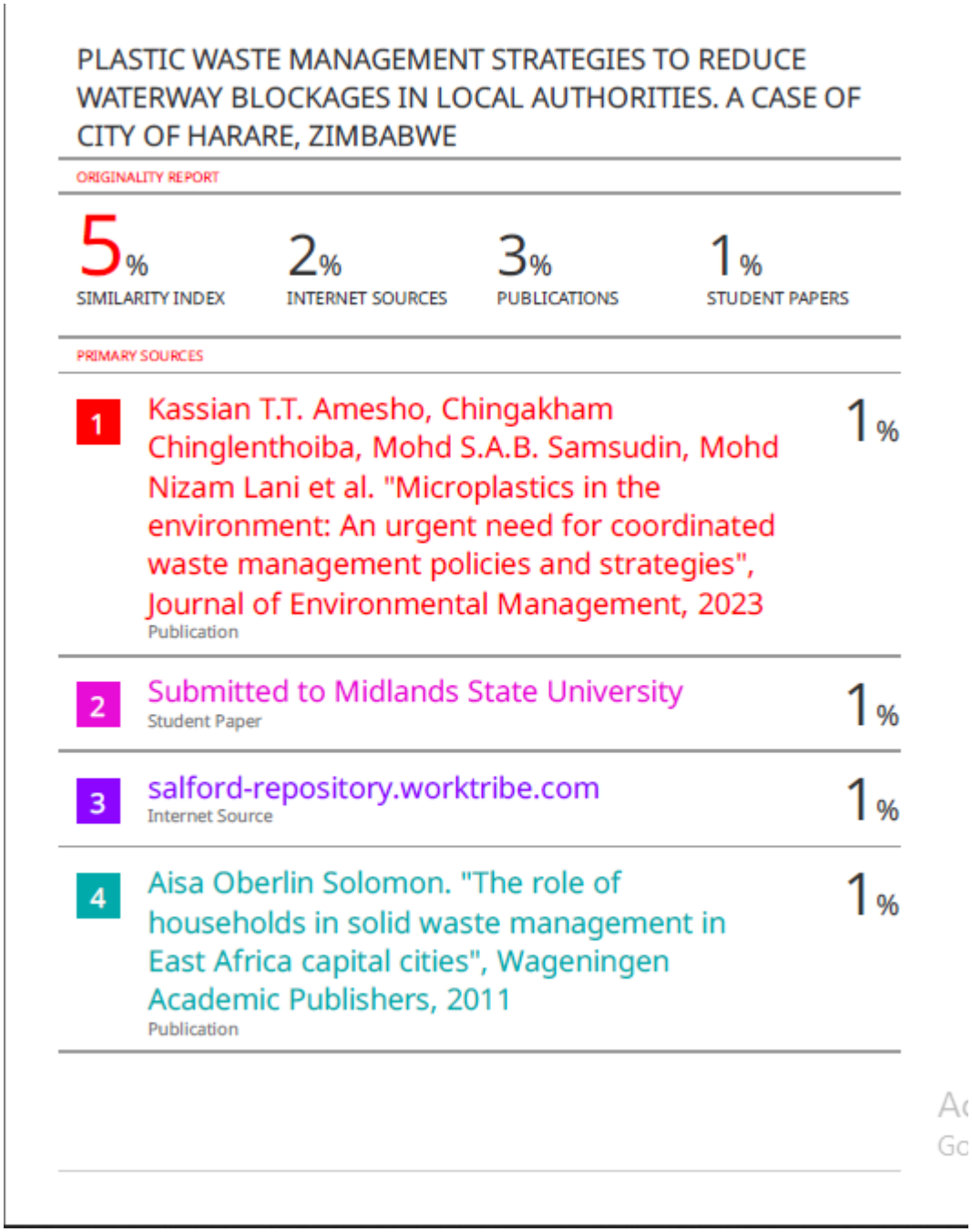

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