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HOUSEHOLD SOLID WASTE MANAGEMENT STRATEGIES IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT: A CASE OF OLD HIGHFIELD SUBURB HARARE ZIMBABWE

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE BACHELOR OF MASTER OF SCIENCE IN OCCUPATIONAL HEALTH SAFETY AND ENVIRONMENTAL MANAGEMENT

BY

PATRICK ALI B241178A

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DEDICATION

I dedicate this work to my late parents, Mary and Alexious, Grandmother Ennie and my mother in-law Enetty for various sacrifices they made towards my education. Most importantly, not forgetting friends who contributed to my academic journey, I dedicate this work to you. May it serve as a testament to the power of perseverance, hard work and dedication. Above all, I say be praised my Lord for you have taken me to dizzy heights.

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ABSTRACT

This study explored household solid waste management strategies in Old Highfield, a high-density suburb of Harare, Zimbabwe, within the framework of sustainable development. The research was guided by four objectives: to examine household waste management strategies, evaluate their effectiveness, identify the associated effects, and recommend sustainable community-appropriate interventions. A mixed-methods approach was employed, incorporating quantitative data from structured questionnaires completed by 255 respondents (83% response rate), alongside qualitative insights from 12 key informant interviews and field observations. The findings reveal that the dominant household waste disposal methods are open dumping (36.08%) and burning (26.26%), with municipal collection accounting for only 15% of waste handling. These practices are largely driven by irregular collection services, limited infrastructure, overcrowding and lack of public awareness. Many households (82.35%) do not practice waste separation due to space limitations, insufficient knowledge and the absence of support systems. The study found that current waste management practices have significant negative impacts, including increased disease prevalence, environmental degradation and socio-economic disruptions such as loss of income for informal traders and rising community conflicts. Evaluations of system effectiveness showed low satisfaction levels, with mean ratings below 2.5 on service adequacy, while environmental risks and disposal difficulties scored high (means >4.0), indicating widespread concern. Key recommendations include the improvement of municipal waste collection reliability, implementation of public education campaigns, enforcement of existing waste management by-laws and provision of infrastructure to support household-level waste separation and recycling. The study also advocates for the development of community-based waste initiatives that can generate livelihoods and promote environmental stewardship.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Full Term
CSOs	Civil Society Organizations
EMA	Environmental Management Agency
GDP	Gross Domestic Product
HDAs	High-Density Areas
ICT	Information and Communication Technology
IUCN	International Union for Conservation of Nature
MoHCC	Ministry of Health and Child Care
MoLGPW	Ministry of Local Government, Public Works and National Housing
NGO	Non-Governmental Organization
SD	Standard Deviation
SDGs	Sustainable Development Goals
SWM	Solid Waste Management
UN	United Nations
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
ZINWA	Zimbabwe National Water Authority

CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE STUDY

1.1. INTRODUCTION

The issue of sustainable development is closely related to household solid waste management that determines the future of environmental protection on a global level. Since the initial report released by the International Union for Conservation of Nature (IUCN) in 1951, which brought up the issue of the necessity to balance the process of economic growth with the need to maintain the environment sustainability in time, the concept of ecologically safe waste management transformed dramatically. Gradually, environmental protection, social responsibility and management of resources has become synonymous with sustainable development (Malik et al.,2021). Smooth waste disposal, such as selective waste utilization and recycling has become a priority to municipalities and organizations that would like to curb environmental degradations (Zon et al.,2020). Solid waste however appears to be an urgent household issue especially in the urban environment since the number of people and poor infrastructure and inadequate waste management policies further agitate the situation. The problem of waste disposal has become a major problem in Zimbabwe and specifically in Old Highfield Suburb, Harare, this has caused environmental pollution, health risks as well as socio-economic issues. In this chapter, the background of the study, problem statement, objectives of the research, research questions, delimitations, definition of terms, significance of the study, limitations and organization of the study are provided.

1.2. BACKGROUND TO THE STUDY

The high rate of urbanization has resulted in a hike of waste being generated in cities globally, which is environmentally and socially costly to those cities managing the solid waste. Due to the increasing population of people who live in habitats and currently represent over 3.5 billion people in urban settings as of 2010 and the estimate that two-thirds of the total population of the world will live in cities by 2025, managing waste has become a serious sustainability challenge (Bhattarai et al.,2021; Maalouf, Mavropoulos & El-Fadel, 2020). Due to the complexity of municipal solid waste (MSW) composition, which is nowadays combined with a continuously growing amount of waste, efficient waste management has become a burning issue on the global scale (Tsui & Wong, 2019; Hoang et al.,2022). Although high-income countries have advanced in urban waste

management due to the use of modern technology and other coherent recycling plans, the impoverished (LI) countries have serious problems in waste management as they lack finances and access to technology (Khan et al.,2022).

On a global scale, the issues of waste management and sustainable development are highly associated with one another, which could be revealed through such thorough consideration of waste management in European countries like Romania. A survey carried out in Romania revealed that 78.4 percent of organizations linked the sustainable development to environment protection initiatives, and 85.7 percent were carrying out social responsibility programs (Ladaru et al.,2020). This shows how people across the globe are becoming conscious of expenditure management as a key pillar of sustainability. European Union (EU) has taken strict measures to facilitate waste reductions, segregation and recycling of waste which maintains the premise that the solid waste management should be a local affair since not all waste conditions and characteristics, financial capabilities and population characteristics to manage them are the same (Magrini, D Addato& Bonoli, 2020; Knickmeyer, 2020, Tsimnadis& Kyriakopoulos, 2024).

Poor Municipal Solid Waste management in various cities across the African continent, which is marked by poor collection of waste, low waste recovery rates, non-optimal disposal and poor execution of the policy, is a significant problem (Serge Kubanza & Simatele, 2020; David Jr, John & Hussain, 2020). This is made more critical by the trend of the rapid urban growth, increase in income and changing consumption, which changes the waste make up and complexities in controlling wastes (Breukelman, Krikke & Lohr, 2019). It has been found that in most African States the Municipal Solid Waste systems lack the adoption of modern forms of analytical methodology to streamline the efficiency of trash removal and dumping, and that has caused inefficiencies in operation and environmental risks (Adedara, Taiwo & Bork, 2023).

The article by Serge Kubanza and Simatele (2020) talks about the implications of the solid waste on the human health and environmental wellbeing in Johannesburg, South Africa. Based on both secondary and primary data collected via semi-structured interview of the local community of Windsor, the official in the municipality and other stakeholders involved in the solid waste management (SWM) in Johannesburg, it concludes that mismanagement of solid waste has adverse impacts on the urban environment and health of the people that results in low productivity and economic development. Moreover, they say that poor SWM should be regarded as a part of

institutionalised failure to deliver and enforce urban policies and regulations and a related failure to realise the significance of involvement of the private agent and community participation in urban development and management.

Household solid waste management is a very essential part of urban environment in the context of Zimbabwe especially in the city of Harare which has faced high rate of urbanization and population growth resulting to high rate of solid waste developments. Nonetheless, the nation experiences harsh conditions of waste management due to poor infrastructure, lack of strict policies and budget limits. Old Highfield Suburb is among the most densely inhabited (and old) neighborhoods in Harare that encounter quite serious problems with waste collection services being inaccurate, disposal sites and infrastructure being undersized, and the absence of general awareness about sustainable ways of waste management (Kwenda, 2021). The crisis of waste management is further developed by other social-economic and political aspects in Zimbabwe.

Waste collection and disposal systems have been weakened quite considerably due to economic fluctuations, corruption, fuel scarcities and under-investment in the provision of it to the population over the last twenty years (Mhlanga & Ndhlovu, 2021). This has resulted in huge quantities of waste not being collected and therefore careless dumping without discrimination in open areas, streets, storm drains and school durawalls. This has led to serious environmental and health threats like breeding of disease transmitting insects and rodents, rise in floods and spread of water-borne related diseases like cholera, typhoid and malaria. It is estimated that waste management and pollution of water sources contributed to the devastating cholera outbreak which floated in Harare, between 2008 and 2009, and claimed the lives of more than 3,500 people (Pachawo, 2023).

The aspect of sustainable waste management also plays an important role towards the realization of the United Nations Sustainable Development Goals (SDGs). Correct waste management and disposal patterns can be in harmony with SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production) and SDG 14 (Life Below Water) (Fatimah et al.,2020). Nevertheless, the development of sustainable waste management systems is not an easy task in such developing states as Zimbabwe because of financial issues, institutional inabilities, and the absence of engagement of people. Considering these challenges, it would be important to have locally based studies conducted regarding household-level solid waste management practices that can be conducted in the framework of

sustainable development. The paper aims at addressing waste management related activities in Old Highfield Suburb; examining factors influencing unsustainable waste management and measures implemented by the community aimed at transforming waste management activities. It is hoped that, through it, the gaps could be identified, and the research could be used to inform the design of more sustainable and effective waste control policies within Harare and other metropolitan regions to address similar problems.

1.3. STATEMENT OF THE PROBLEM

This factor in the form of poor household solid waste management in Old Highfield suburb in the city of Harare constitutes a major environmental, health and socio-economic issue that challenges the ideals of sustainable development. Even in the presence of legal and institutional frameworks, including The Statutory Instrument No. 6 of 2007 which regulates waste management activities and The Statutory Instrument No. 10 of 2007 which regulates waste of hazardous nature, the terms of disposal of waste are not satisfactory, and this has resulted in pollution, outbreak of diseases and sight depreciation. Although the research on solid waste management in Zimbabwe has already been conducted, existing literature did not particularly cover the way residents deal with household solid waste as a form of sustainable development. Failure to correct these problems associated with waste management has compelled people to improvise some of these methods of managing waste which could be an additional health and environmental hazard to society. Since the costs of environmental deposition resulting in waste production have become crucial in the realization of Sustainable Development Goals (SDGs); especially those associated with clean water and sanitation (SDG 6), sustainable cities and communities (SDG 11) and responsible production and consumption (SDG 12), the proposed research project aims at exploring how Old Highfield residents deal with household solid waste. The research aims to shed some light to the community-based waste management strategies that may improve urban living standards and sustainability in the city of Harare through the study of such strategies.

1.4. AIM

This study generally aims at examining the household solid waste disposal strategies being utilized by the residents of Old Highfield and also on how they can better manage their waste in the context of sustainable development.

1.5. SPECIFIC OBJECTIVES

1. To analyze household solid waste management strategies currently employed by Old Highfield residents.

2. To evaluate the effectiveness of waste management strategies used in Old Highfield based on sustainability criteria, including environmental, economic and social impacts.

3. To identify the health, social, economic and environmental effects of existing household waste management strategies in Old Highfield.

4. To develop and recommend feasible and sustainable household solid waste management strategies tailored to Old Highfield suburb.

1.6. RESEARCH QUESTIONS

1. What are the current household solid waste management strategies employed by Old Highfield residents?

2. How effective are the strategies used by residents in managing household solid waste in the context of sustainable development?

3. What are the health, social, economic and environmental impacts of the household solid waste management strategies currently employed by residents?

4. What alternative or improved waste management strategies can be proposed to enhance sustainable household solid waste management in Old Highfield?

1.7. SIGNIFICANCE OF THE STUDY

The continuous increase in human populations necessitates the need for responsible authorities to remain proactive in adapting and improving household solid waste management strategies to align with sustainable development targets (Suryawan & Lee, 2024). This study is particularly significant for the government of Zimbabwe, the Highfield local authority and the residents of Old Highfield, as it highlights critical issues related to household solid waste management, including waste generation, storage, transportation and disposal. The study will add significant insights to the corpus of information already available on waste management by illuminating these difficulties.

A deeper understanding of sustainable development requires discussions on the environmental impacts of solid waste at all levels, starting from the community. This research provides an opportunity for residents to voice their perspectives on household solid waste management within their environment, fostering community engagement in achieving sustainable development and healthier living conditions.

Additionally, this study aims to support the development of effective household solid waste management strategies in Old Highfield, aligning with the United Nations' Sustainable Development Goals (SDGs), particularly Goal 11 (Sustainable Cities and Communities) and Goal 12 (Responsible Consumption and Production). The findings will be instrumental in guiding policymakers and local authorities in formulating targeted interventions and programs that empower communities to address waste management challenges effectively, promoting sustainable urban development.

From an academic standpoint, this study will serve as a valuable resource for future scholars and researchers by contributing empirical evidence to the field of waste management. The findings will provide a foundation for further research, enabling future studies to build upon the insights gained and explore innovative solutions for improving waste management practices in urban settings.

1.8. DEFINITION OF TERMS

Waste

It is any substance in a given time and place which in its actual structure and is not useful to the owner or is an output without an owner and purpose. On the other hand, waste is anything that we no longer need. It is also referred to as rubbish, trash, garbage, refuse, effluents and “unwanted or unusable materials “(Pongrácz & Pohjola, 2004).

Waste management

This refers to all issues and processes associated with the generation, processing and disposal of all categories of waste produced by human activities or related to human existence; it includes, therefore, the stages of production and minimization ‘collection, handling and transportation, reuse and recycling and treatment and disposal of all such waste (Pongrácz & Pohjola, 2004).

Sanitation

This refers to collection, storage, transportation and the final disposal of both human and industrial waste. The purpose of sanitation is to reduce or stop the spread of diseases by disposing of the waste safely thereby safeguarding human health and minimizing environmental pollution (Pires, Martinho, Rodrigues & Gomes, 2019)

Health

It is the level of functional or metabolic efficiency of a living being. In humans, it is the general condition of a person's mind and body, usually meaning to be free from illness, injury or pain. The World Health Organization (WHO, 2010) defined health in its broader sense as a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity as cited in Misselbrook (2014).

Sustainable Development

Defined by Emina (2021), sustainable development is a development process that ensures present needs are met without endangering the ability of future generations to meet their own needs**.**

1.9. DELIMITATIONS OF THE STUDY

This paper had special interest on household solid waste management operations by residents of Old Highfield suburb in Harare of Zimbabwe concerning sustainable development. The geographic area was thus restricted to this region to favour the manageability of the research process and to enable in-depth research into how the subject of the research is undertaken in a specific community.

Households were the main target of the study and not the industrial, commercial or institutional waste management systems. This specification guaranteed that the study would be focused and limited itself to the sphere of domestic waste disposal practices and their implications in sustainable development.

CHAPTER 2: LITERATURE REVIEW

2.1. INTRODUCTION

This chapter gives a detailed literature review of household solid waste management (HSWM) basing on sustainable development and targeting the case of Old Highfield Suburb, Harare. It discusses theoretical approaches to garbage management like the waste management hierarchy and integrated solid waste management, as well as a historical retrospective of waste management practices. The chapter will look at existing waste management strategies, their effectiveness according to the sustainability standards, their economical, environmental and social effects. It also brings out health, social and economic issues related to the current practices, and it examines the best practices of case studies that have been carried out in various parts of the world to make recommendations that are sustainable to Old Highfield. This review provided a theory, empirical basis of the study, gaps and potential of better waste management.

2.2. THEORETICAL REVIEW

The theories on which household solid waste management and sustainability are based enable one to have an insight on how the factors involved relate and the problems and effective measures of waste management. Major theories that are applicable to this project are the Systems Theory, Sustainable Development Theory and the Waste Management Hierarchy.

2.2.1. SYSTEMS THEORY

Systems Theory according to Von Bertalanffy (1968) takes solid waste management as a system, which has basic elements that include waste generation, collection, transportation, treatment and disposal. Inefficiency in any sector of the system could be a cause of inefficiency, environmental pollution and health hazard like the case of inefficient waste management whose effects entail illegal dumping, accumulation of toxic wastes. The theory also highlights the necessity of feedback systems and stakeholder coordination (e.g. authorities, waste companies and residential communities) in the process of waste management so that it may be managed effectively and promotes the integrated approach which aims to combine social, economic and environmental systems to develop sustainable solutions.

2.2.2. SUSTAINABLE DEVELOPMENT THEORY

It is noted that Sustainable Development Theory focuses on balancing economic development, social justice and conservation of the environment in the development of a waste management strategy. According to Emina (2021), sustainable development refers to a development process that would fulfill the current needs in a manner that would not jeopardize the capacity of the future generation to meet their needs. The theory highlights the importance of a good management of wastes in preventing depletion of the use of resources, land degradations, and pollution, which lead to a possible risk to long-term sustainability. The 2030 Agenda of the United Nations has defined waste management as one of the pathways to the realization of SDGs and more specifically Goal 11 (Sustainable Cities) and Goal 12 (Responsible Consumption). It proposes the policies based on the green technology, involvement of the people, and extended producer responsibility (EPR) where the waste management happens in an economically and environmentally economical manifestation.

2.2.3. WASTE MANAGEMENT HIERARCHY

According to the Waste Management Hierarchy given by Gertsakis and Lewis (2003), the action of waste management is guided towards the level of its prioritisation depending on the environmental impact that has been contributed. It prefers waste prevention as well as minimization as the most preferable activities, reuse, recycling, energy recovery and disposal, as the last resort. Avoidance of waste will stop the wastes at the source of the origin, whereas reuse will prolong the life of the products and reduce new materials. Recycling saves resources and improves dependence on landfills and energy-based methods of disposal such as incineration with energy recovery provide substitutes to waste disposal. The least preferable mode of disposal, especially through landfill or non-energy recovering incineration, is because of the environmental dangers. The hierarchy advocates sustainable waste management and circular economic strategies which have made governments and organisations across the world adopt the universality strategy.

A combination of these theories offers an in-depth background of household solid waste management in that it falls under the systems approach requirement, sustainable development characteristics, and hierarchy concept of waste management. The combination of the theoretical legal perspectives allows the policymakers, waste management experts and communities to create

viable waste management solutions, which in turn limit environmental disturbance, enhance resource fulfilment and sustainability in the long-term perspective.

2.3. SUSTAINABLE DEVELOPMENT AND SUSTAINABLE DEVELOPMENT GOALS (SDGS)

The concept of sustainable development is rooted in balancing economic growth, social inclusion and environmental protection. The SDGs provide a framework for addressing global challenges, including sustainable waste management (United Nations Department of Economic and Social Affairs, 2022). The transition from the Millennium Development Goals (MDGs) to SDGs recognized the need for a broader set of targets, such as SDG 11 (Sustainable Cities and Communities) and SDG 12 (Responsible Consumption and Production), which emphasize sustainable waste management strategies.

2.4. IMPACTS OF SOLID WASTE MANAGEMENT PRACTICES

Waste management policies in Zimbabwe have evolved from the colonial policies to more recent environmental policies, but the issue persists. Attempts such as the Environmental Management Act of 2007 and decentralization of water management to the local government in 2009 have been made, but they are eroded by fiscal shortages and enfeebled enforcement. Historical issues, such as illegal dumping and Operation Murambatsvina effects, continue to plague waste collection in the current era, with collection efficiencies as low as 30% in some cities. Limited availability of finances and failure to sign the Basel Convention limit solution implementation towards waste problem eradication. Inadequate solid waste management (SWM) in developing countries also significantly limits progress towards sustainable development by causing pollution, unsanitary health conditions and economic strain.

2.4.1 ENVIRONMENTAL IMPACT

Inefficient poor SWM in developing countries has serious environmental consequences since practices such as open dumping, open burning and poorly disposed landfills are significant sources of pollution. Open dumping has the consequence of releasing harmful pollutants into the environment and contaminating water sources with possible breeding sites for disease-carrying vectors, while open burning spreads toxic fumes like dioxins and furans that are toxic, carcinogenic and health-harming by inducing respiratory disease (Weligama Thuppahige & Babel, 2021; Ebrahimi-Moghadam & Farzaneh-Gord, 2023). Landfills yield leachates, a toxic liquid containing

heavy metal and organic pollutants, which seeps into groundwater and makes them unsuitable for consumption by humans and agriculture (Conke, 2018). Furthermore, degrading organic wastes in landfills produces methane, an extremely potent greenhouse gas that causes global warming (Hoang et al., 2022).

Improper waste treatment is also accountable for the excess use of raw materials since, in the lack of effective recycling mechanisms, natural resources are continuously exploited. In the absence of recycling schemes, unsustainable use of resources such as minerals and forests persists. Meanwhile, sustainable models of waste management, such as recycling, composting and waste-to-energy facilities, have the potential to reduce pollution, conserve resources and mitigate the impacts of climate change (Conke, 2018). These practices are very significant in enhancing ecological sustainability and reducing environmental degradation caused by poor waste management (Yalcinkaya & Uzer, 2021). It is therefore required that developing countries adopt environmentally friendly waste management practices for the attainment of long-term benefits for the environment and society.

2.4.2 SOCIAL IMPACT

Poor waste management not only causes environmental damage but also significant social impacts, particularly in public health. Poorly managed waste directly affects upper respiratory diseases, infectious diseases and other health conditions among affected communities. Open waste burning releases fine particulate matter (PM2.5) and toxic gases that penetrate deep into the lungs and therefore, form long-term respiratory diseases like asthma, bronchitis and lung cancer (Krecl et al., 2021). In addition, the unchecked landfill dumping releases noxious fumes and stinking odors that negatively impact residents' quality of life and develop health conditions such as skin problems and eye infections. Vulnerable groups such as children and women bear disproportionately the health consequences of ineffective waste management, with women, most often responsible for managing domestic refuse, exposed to harmful substances more often (Bhattarai et al., 2021) and children residing in environments around dumps severely exposed to chemicals and infection.

Most social and occupational issues are also being experienced by informal waste pickers in most developing economies given that they form the bulk of recycling activities. Despite their importance of waste recovery and resource efficient utilization, they are most likely to operate under unsafe conditions which lack all the legal protection, medical care and social security and

this increases the opportunity that they are going to have exploitation and discrimination (Salve & Jungari, 2020). Routine exposure to toxic waste such as medical, electric etc. makes these workers quite susceptible to getting infected (Kristanto, Kemala & Nandhita, 2022). To solve these social ills, social policies are needed to professionalize the informal waste collectors into formal waste management networks and equip them with personal protection gears and better working conditions to guarantee improved health and social outcomes of these marginalized societies (Tsui & Wong, 2019).

2.4.3 ECONOMIC IMPACT

The cost of managing municipal solid waste is so expensive in developing nations that collecting, transporting, treating, and disposing of waste materials are all stresses to the government budget (Benitez-Bravo et al., 2021). The inefficiencies in waste management in systems do not only overburden healthcare services due to the contraction of disease caused by waste but also hurt tourism and property through the production of dirty environments that drive tourism and investment away (Benitez-Bravo et al., 2021). Moreover, the absence of recycling and circular economy infrastructure leads to the loss of economic possibilities as the recyclables are not turned into recyclables and are instead delivered to the landfill, instead of being re-used and/or turned into added-value products. Well-regulated waste-to-energy schemes and recycling schemes can decrease the costs related to the management of municipal solid waste, create jobs and boost the economy (Yalcinkaya & Uzer, 2021).

In addition to the direct economic costs, pollution of the environment by wastes has also economic effects in the long-term sense. Landfill leachates contaminate the water bodies that cost the government high funds to clean and open burning pollutes air, which causes further respiratory diseases and thus causes productivity loss and extra expenditure on healthcare (Benitez-Bravo et al., 2021). All of these economic losses can be minimized through sustainable waste management solutions such as recycling, resource recovery and waste-to-energy technologies that provide jobs and raise resources efficiency. The environmental, social and economic effects of ineffective waste management should be fought in an interdisciplinary way that will balance between prevention, recycling and the general policies governing everyone so that the waste management system could be optimized and viably promote sustainable growth in developing nations.

2.5. CHAPTER SUMMARY

The review of literature shows the central relationship between SWM and sustainable development. The adverse consequences of waste management in the environment, social and economic undercurrents highlight the sustainability of waste reduction, recycling and policy enforcement. The solutions to these problems in Old Highfield must be a combination of the intervention of local powers, community involvement, and alternative technologies of managing waste to fit the sustainability agenda.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter gives a definite description of the research strategy that was used when researching on the topics of research which were household solid waste management strategies in Old Highfield, Harare, in the context of sustainable development. The study set out to examine what strategies were in use by the people of Old Highfield in relation to handling their solid waste, assess the viability of such strategies against the sustainability assessment and also determine the impacts of such strategies and lastly formulate achievable guidelines to have better strategies that would be suitable to the suburb in relation to handling their waste material.

The research methodology chapter describes the series of steps followed in the designing and conducting of the study, which is a clear guideline on how data was taken, analyzed and the interpretation. The study methodology was developed to serve the main goals of the research which are to gain a deep insight into the way waste is currently treated, the sustainability of the chosen solution and the health and environmental problems of the concerned community. Since solid waste management is a complex issue and is also associated with social, economic and environmental sustainability, the qualitative research method as well as the quantitative research method were chosen to give detailed analysis in multi-dimensional form. The choice of a particular research techniques, including methods of gathering data, which is questionnaire, interview and observational, were argued by giving rationale as to why the study chose the approaches in collecting data. Also, the sampling strategy, data analysis procedures and ethical issues in undertaking the study were well explained to provide transparency, reliability and validity in the research process.

3.2. RESEARCH DESIGN

Descriptive research design was utilized by the researcher. Alluding to Bryman et al. (1988), research design is all about the arrangement of condition, collection and analysis of data in such a way that seeks to combine relevance to the research purpose with economy in procedure. As for Tharenou, Donohue and Cooper (2007), research design is viewed as a blueprint for fulfilling objectives and answering questions for example, one may decide on secondary data, experiment, survey or even experiment. Additionally, Pandey and Pandey (2015) postulated that descriptive research is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals. More so, descriptive research is a form of an investigation which attempts

to describe and interpret what exists at present in the form of conditions, practices, processes, trends, effects, contributions and beliefs (Rassel, Leland, Mohr & O'Sullivan, 2020). Descriptive research seeks to present facts in relation to nature and situation status, as it exists at a time of the study and to describe conditions present systems or events based on reactions or impressions of the respondents of the research. Moreover, descriptive research design was significant as it determined how information would be collected. In designing the research, the researcher took into consideration the characteristics of the population when drawing up the sample from the population.

Descriptive design suits the selected area of study which represents high density suburbs of the third world. According to Asenahabi (2019) descriptive research design is done if one requires to understand the characteristic of a certain phenomenon to solve a particular problem at hand. It is against this background that the study saw it as worthy to use the design to investigate household solid waste management strategies employed by residents of Old Highfield suburb in the context of sustainable development. The design under discussion provided a way of accessing unquantifiable facts about the actual people the researcher observed and talked to, or people represented by their personal traces. More so, the researcher viewed it as appropriate as it gave more room for the use of several data collecting methods.

3.3. POPULATION AND SAMPLE

3.3.1. STUDY POPULATION

The target population for this study consisted of the residents of Old Highfield, a suburb of Harare, Zimbabwe. According to the 2012 Zimbabwe National Statistics (ZIMSTATS), the population of Old Highfield is approximately 3,500 people and there are around 1,200 households in the area. This population includes men, women and children, as well as individuals from different socio-economic backgrounds. The study focused on understanding the waste management strategies of these households, the effectiveness of these strategies and their sustainability in the context of the environment, health and socio-economic factors.

3.3.2. SAMPLE SIZE

To ensure the sample accurately represented the target population, a scientifically calculated sample size was necessary. The formula used for determining the sample size was based on a

confidence level of 95% and a margin of error of 5%. The formula for calculating the sample size is as follows:

$$n = \frac{Z^2 P(1-P)}{E^2}$$

Where:

n = Sample size

Z = Z-score corresponding to the desired confidence level (1.96 for a 95% confidence level)

p = Estimated proportion of the population (0.5 is used for maximum variability if no prior information is available)

E = Margin of error (0.05 for 5%)

Given that the population size N I was 1,200 (households), the researcher applied the finite population correction (FPC) to adjust the sample size calculation:

$$n_{fp} = \frac{n}{1+\frac{n-1}{N}}$$

Where:

n_{fpc} = adjusted sample size

n = sample size from the initial calculation

N = population size (1,200 households)

Substituting values

$$n = \frac{1.96^2\ 0.5(1-0.5)}{0.5^2}$$

$$n = 384$$

Applying finite population correction (FPC):

$$n_{fpc} = \frac{384}{1+\frac{384-1}{1200}}$$

$$n = 307$$

Therefore, the adjusted sample size for this study was approximately **307** households.

3.3.3. SAMPLING TECHNIQUES

The research involved both quantitative and qualitative sampling methods, which were applied to guarantee the retrieval of not only numerical but also detailed information.

a. Stratified Random Sampling

Stratified random sample is a method when a population is divided into clearly defined subgroups of discrete characteristic of the population and participants are selected in each subgroup randomly. The approach comes in handy when the researchers desire to make sure that the various strata of a population are properly sampled. Stratified sampling, according to Cochran (1977) is suitable when the population is heterogeneous, and the researcher wishes to come up with a better estimate of population parameters because all relevant subgroups are covered. This technique is useful in helping to decrease sampling error because as the rules would become more precise when using the sample, particularly with the presence of considerable differences in the population. In case of proportional and equal allocation, stratified random sampling may be utilized according to the needs of the research.

Stratified random sampling technique was utilized in this research study so that the sample of 307 households of the Old Highfield should fully reflect the various aspects of the population. The factors that formed the strata of the study included; the household size, level and kind of waste produced (e.g., organic, recyclable, and dangers waste). These attributes were selected since they had the potential to determine household waste management practices. Randomly, proportional representation was taken by identifying the households under each subgroup after identification of the farms. The list of all households of all strata was developed. Afterwards, clear identification numbers were assigned to all the residences within the stratum. Then a random number generator in Microsoft Excel was used to sample households at random off the list. This made it possible to have a more in-depth view into how members of various categories in the community manage waste because, as Pandey and Pandey (2015) explain, stratified sampling makes the sample more representative especially when the study involves a heterogeneous population. This was applied because the research problem was to collect a wide-ranging box of the household waste management practices and to make sure that the result was generalized to the whole of the Old Highfield suburb.

Table 1 : Sample Size

Stratum (Household Category)	**Population Size**	**Proportion of Total Population**	**Sample Size for Each Stratum**
High-income households	300	25%	77
Middle-income households	600	50%	153
Low-income households	300	25%	77
Total	**1,200**	**100%**	**307**

Source: Author's configuration.

a. Purposive Sampling

Judgmental sampling, purposive sampling or selective sampling is a non-probability method of sampling being involved with the selection of the participants on the basis of certain characteristics or traits that are associated to the research goals. This type is common in the scenarios where a researcher is required to concentrate on specific people with a view that the person can be a source of richer information, which is relevant and detailed about the research topic. The authors affirm that according to Etikan, Musa and Alkassim (2016), purposive sampling is especially helpful when conducting qualitative research since it gives an opportunity to dig deeper into the research topic through participants whose perspective is based on direct experience or expertise in a field relating to the study. In contrast to random sampling that is intended to represent the population statistically, purposive sampling is developed to be as deep and relevant in data as possible and make sure that the sample is highly suitable to answer the research questions.

The qualitative phase of this study involved the purposive sampling process, more precisely when identifying the key informants e.g. community leaders, local waste management officers and the residents having an active role in the waste management initiatives. These actors were selected because of their knowledge or involvement or specialisation in the area of household waste management in Old Highfield. The researcher collected more qualitative and contextually detailed data to sustain the quantitative results through selecting individuals with a specific knowledge or personal experience of the complexities and strategies of dealing with trash. Pandey and Pandey (2015) also speak in favour of such an approach, as in case the researcher wants to understand a

certain phenomenon on a deeper level or to see how people with specific experiences view this phenomenon, purposive sampling is the best option.

3.4. DATA COLLECTION

Data collection process was systematic and undertaken within a given duration to be rather comprehensive and accurate. The initial intervention entailed issuing of structured questionnaires among sampled households at the Old Highfield Suburb. The respondents were provided with a lapse of two weeks to fill in and mail the questionnaires so that they could give ample time to consider responses. The questionnaires were filled and semi-structured interviews carried out on local members of the community in key positions such as municipalities, environmental health officers and community leaders. The interviews were allowed a flexible 3 weeks' period to give room to in-depth discussions (Hollweck, 2015). Proper to the possibility, face-to-face interviews were maintained, and phone or virtual ones were possible alternatives.

At the same time, it was observed first-hand during a 3-week period to record real-time waste management. observations were made at varied times during day and the times which were varied were the days of week so that any differences in waste disposal practices were recorded (Levitt et al.,2018). Among the indicators reflected in the observation checklist were the availability of waste bins, regularity of waste collection and manifestations of any illegal dumping and burning. As a measure to increase data reliability, make-ups were done among the non-respondents after the two weeks to promote participation in the research. Also, another set of interviews with some of the respondents was scheduled to get clarifications or to expand more on key findings.

It was expected that the full process of data collection would require about six weeks because there were some probabilities to collect data in a staggered order and follow-ups were required as well. This method of data collection was based on an organised plan of collecting data and as such ensured the validity, integrity, and reliability of data so collected to support the research findings on the home solid waste management practices in Old Highfield Suburb, Harare, Zimbabwe.

3.4.1. INSTRUMENTATION

The research reached out to quantitative and qualitative data collection tools. These used tools were created with a lot of considerations that have resulted in their reliability and validity in obtaining pertinent data of the chosen sample population. Structured questionnaires, semi-structured interviews and the use of direct observations were the major data collection tools

adopted in this research. The detailed questionnaires were to capture quantitative information on the amounts of household waste produced, management systems and ideas of the presence of a sustainable waste management system. Such questionnaires were based on works where waste management and sustainable development were already studied (Field, 2018; Ajani & Fakunle, 2021) which further provided that the items were reflective of available literatures. The questionnaire comprised of the closed-ended questions in the form of a language-based Likert scale (e.g. strongly agree to strongly disagree) to measure attitudes, awareness and involvement towards the strategies for managing waste.

In completing the quantitative information, semi-structured interviews were also carried out with key stakeholders such as local government leaders, environmental health officers and community leaders. The interviews elucidated more about the issues, policies and potential interventions regarding the solid waste management on household level. The interview guide was formed on the basis of the themes that have been identified during the literature review which makes it relevant and comprehensive (Hollweck, 2015). Open questions enabled the study to have a more qualitative aspect as it allowed the respondent to give details of what they observed and felt. Moreover, direct observations were also done to evaluate the factual practices of waste management in the community. The variables used on the observation checklist comprised waste segregation, frequency of waste collection and the existence of waste disposal units. This approach assisted in corroborating self-reported data recorded on the questionnaire and in the interview, which is why the bias in responses was minimized (Asenahabi, 2019).

3.5. DATA ANALYSIS

Quantitative and qualitative methods of analysis were employed in analyzing the data collected, and this was in line with the aims and research questions of the study. The Statistical Package for the Social Sciences (SPSS) was employed by using structured questionnaires approach that analyzed quantitative data. Household waste management behaviors and perceptions including values were summarized and interpreted using descriptive statistics of means, standard deviation, frequencies and percentages (Field, 2018). To gather analyses of relationships between the demographic variables and waste management processes, cross-tabulations was utilized. Key findings were indicated using graphs and tables.

With qualitative data acquired with the help of semi-structured interviews and direct observations, qualitative data analysis software like NVivo has been used with the help of which thematic analysis was performed. Thematic analysis entailed discovery, examination and description of themes (patterns) in the data (Braun & Clarke, 2006). Transcription and coding of data was done after which thematic categories were developed which corresponded with the research questions of the study. NVivo made it possible to organize the large qualitative datasets, and consequently, there was the ability to obtain systematic retrieval of the relevant themes and sub-themes.

The combined quantitative and qualitative studies allowed investigating the aspect of household solid waste management strategies in Old Highfield Suburb in depth. The research made a subtle addition of sustainable methods of waste management by combining it with thematic knowledge and descriptive data. The findings of the two methods of analyses were combined and used to make logical conclusions that will guide policy formulation on how to enhance waste management system in the suburb. Member checking and peer debriefing were carried out to ensure the integrity of the qualitative findings and make them dependable. Thematic interpretations were checked by selected participants in order to establish their accuracy and the coding framework was checked on by expert researchers in order to establish its consistency. This strategy increased the quality and dependability of the qualitative examination of the study.

3.6. VALIDITY AND RELIABILITY

To maintain reliability and validity, several measures were applied to confirm the accuracy and the validity of the results. In the quantitative method, the calculation of the reliability and the clear or understandability of the questions used in a quantitative research method, a pilot study was carried out prior to the actual gathering of the data. In order to guarantee the instruments reliability and validity, a pilot test was executed by a small sample group of those who showed similarity to the sample of the main study yet did not take part in the actual study. Also, the instruments were reviewed by professionals on waste management and academic researchers on their content validity before its final distribution. The pilot study was useful to discover errors, vague questions and answers to begin the necessary changes prior to large-scale distribution (Saunders et al., 2019). The reliability of the instrument used in measuring internal consistency of the likert scale items was determined by Cronbach alpha (Field, 2018).

In the case of qualitative data, the level of credibility was boosted by member checking and peer debriefing. The step of checking the members was used where preliminary findings were shared with the chosen participants as a way of verifying their responses to ensure they have been interpreted accurately (Lincoln & Guba, 1985). This made sure that the findings of the studies are mirror images of what the participants hold and experience. The point to be debriefed by peers was the discussions with someone who has the same or similar level of expertise in the waste management field with the authors of this paper or other researchers. The rationale behind it is to discuss the themes, interpretations, etc., as one of the ways to challenge these motivations and ideas. This was done to reduce possible biases, and it was able to increase the validity of the qualitative results (Levitt et al.,2018).

Triangulation also made the study more valid as it combined the sources of information such as the survey responses, interviews and observations (Denzin, 2012).

3.7. ETHICAL CONSIDERATIONS

There are ethical issues which at one time or another confront researchers during the research process. They are expected to be led by ethical rules as offered by professional associations. The rules are meant to safeguard the participants particularly when they are children. Hence, the concepts of ethical research have taken root in the undertaking of productive and substantial research. In that sense, the actions of individual researchers tend to face being under scrutiny more than ever before. Denzin (2017) defines ethics as rules or regimens of good professional practice which help to guide and assist a researcher in the course of his work. Ethics in social research comprise the informed consent, no subject harm, research integrity, privacy, voluntary participation, anonymity and confidentiality.

Informed consent was used so that the future participants of the research voluntarily consented to participate in the investigation, being already aware of its purpose, procedures and risks (Xu et al., 2020). The researcher also identified himself to the respondent, clarified on the academic motive of the study and that it was voluntary. Older children had communicated in understandable language the purpose of the research and written approval was taken. The sample population was made aware of the option of withdrawing at any point in time, lest an individual be forced or could be deceived into taking part without their knowledge and consent. Another ethical point that should be mentioned is confidentiality because, according to Nafsi (2023), the researchers are required to

maintain total secrecy of information that will be gained during the research. To support this the researcher made sure that the data collected would only be used academically and will be at all times kept confidential. Moreover, it is imperative to have access to research sites and participants because sometimes ethical issues form an obstacle to scientific research (Hollweck, 2015). The researcher had the resources to access respondents and the applicable authorities through the provision of an official letter of the college, identification credentials including the university ID card and the national ID card in the data collection process, which was taken to be credible and ethically compliant.

3.8. CHAPTER SUMMARY

This chapter indicated the research methodology that was used in carrying out a study on the household solid waste management strategies in the Old Highfield Suburb, Harare, Zimbabwe. It describes the research design that incorporated both quantitative methods and qualitative approaches in order to have an in-depth analysis of the topic. Data collection was undertaken by means of the structured questionnaires, semi-structured interviews and direct observations, providing reliability and validity of the study by testing it using the pilot study, member check and peer debriefing. The quantitative data analysis was conducted using SPSS, in terms of descriptive statistics, whereas the qualitative data analysis was based on the thematic analysis, reinforced by NVivo. Ethics-based issues such as informed consent, secrecy, and entry acquisition were also followed to the latter, whereby there was free will to participate and protection of information. The chapter also expounded on the methods of ascertaining credibility and reliability of the results in terms of triangulation.

CHAPTER 4: RESULTS

4.1 INTRODUCTION

The chapter provides the information on data analysis and key findings of the research. To present the findings of the research in a logical way, the chapter is divided into a number of crucial sections. It starts by giving a description of the response rate as well as demographic details of the respondents, which presents a perspective to the interpretation of data. It is then preceded by a study in the main research questions and findings of the study being presented in details.

4.2 RESPONSE RATE

The study response rate was 83%. Based on a total of 307 participants to be sampled 255 respondents or survey instruments were properly filled and returned. Rainsford and Saunders (2024) state that this rate of response is also adequate and appropriate to the research of this type to guarantee the reliability and representativeness of the retrieved information.

4.3 RESPONDENTS DEMOGRAPHIC PROFILES

The study questionnaire was separated into sections, with the first asking for the respondent's profile. The purpose of this section is to describe these demographic characteristics.

Table 2 : Demographic characteristics of respondents

Characteristic	Category	Percentage (%)
Gender	Male	35.33
	Female	64.67
Age Group (years)	18–25	13.33
	26–35	40.00
	36–45	36.00
	46–55	10.00
	56 and above	0.67
Household Size	1–3 members	21.2
	4–6 members	54.1
	7 or more members	24.7
Educational Level	No formal education	7.1
	Primary education	16.5
	Secondary education	50.6
	Tertiary education	25.9
Employment Status	Unemployed	38.0
	Self-employed	33.0
	Formally employed	29.0

The demographic data indicate that 35.33% of the respondents were male, while 64.67% were female. In terms of age distribution, the majority of participants were between 26–35 years (40%), followed by those aged 36–45 years (36%), 18–25 years (13.33%), 46–55 years (10%) and only 0.67% were 56 years or older. Regarding household size, most respondents reported living in households with 4–6 members (54.1%), followed by those with 7 or more members (24.7%) and 1–3 members (21.2%). Educational attainment varied, with 50.6% having completed secondary education, 25.9% tertiary education, 16.5% primary education and 7.1% having no formal education. Employment status data showed that 38% of respondents were unemployed, 33% were self-employed and 29% were formally employed.

4.4 HOUSEHOLD WASTE MANAGEMENT STRATEGIES

From the questionnaire responses, it was revealed that the most commonly used waste disposal strategy was open dumping, with 36.08% of the respondents indicating it as their primary method of waste disposal. This was followed by burning at 26.26% and municipal collection, which accounted for only 15% of responses. A small proportion of households reported using composting (7.06%), recycling (6%), or other methods (9.8%) such as burying. These findings are summarized in Table 3 below.

Table 3: Waste disposal methods used by households

	Disposal Method	**Frequency**	**Percent**	**Cumulative Percent**
Valid	Municipal collection	38	14.92	14.92
	Open dumping	92	36.08	51.00
	Burning	67	26.26	77.26
	Composting	18	7.06	84.32
	Recycling	15	5.89	90.21
	Other (e.g. burying)	25	9.80	100.00
	Total	**255**	**100.0**	

Interview data strongly reinforced these quantitative findings. A local community leader explained:

"There are no skip bins anymore and the collection trucks do not follow a schedule people are now forced to dump waste wherever they can."

A municipal waste officer acknowledged the problem, saying:

"We are under-resourced. There is only one working truck for the whole district, and it cannot cover all areas weekly."

Residents shared their coping strategies, with one middle-aged woman saying:

"We dump waste at night, fearing arrest by the police."

Another resident added:

"We burn our rubbish at the back of the house to avoid bad smells."

The majority of respondents (58%) reported irregular waste collection, while only 20% experienced weekly pickups as scheduled, and smaller percentages noted bi-weekly (13.31%), daily (4%), or monthly (5%) collections. These results are presented in Figure 1.

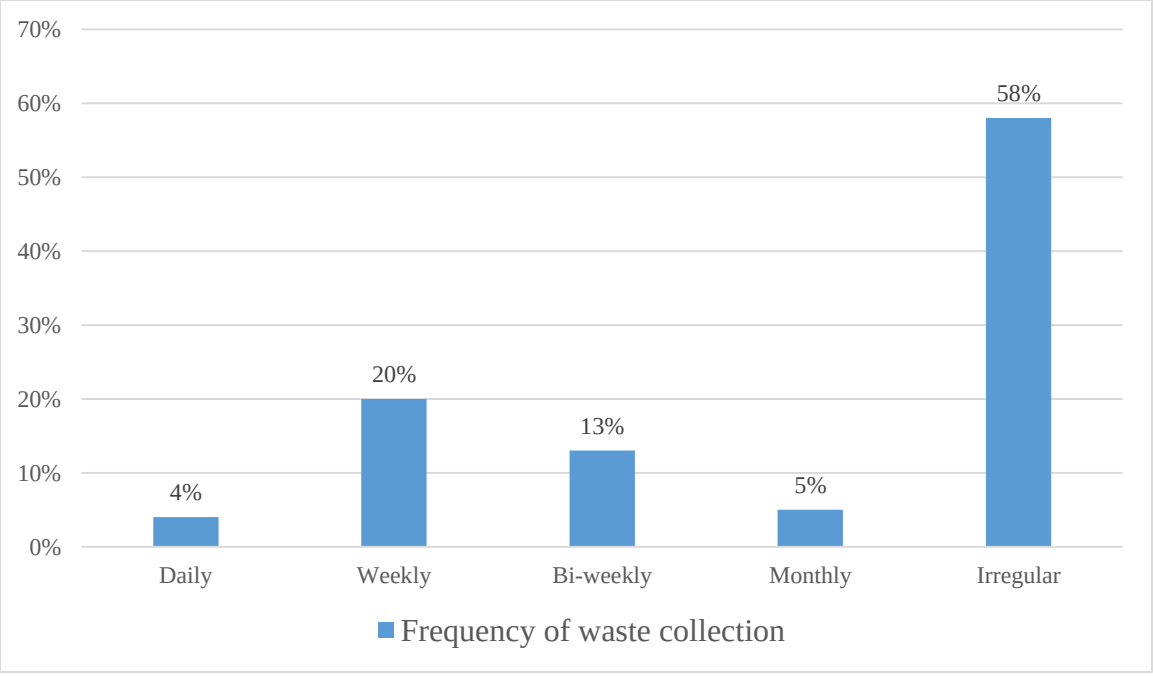

Figure 1: Frequency of waste collection

This inconsistency in waste collection was echoed in the interviews, with many residents expressing frustration and distrust in the Harare City Council's ability to manage waste effectively. Observations in the field confirmed overflowing bins, illegal dumpsites and frequent open burning in both residential backyards and public spaces. Interviewees commonly voiced dissatisfaction, with one elderly resident remarking:

> *"The council has failed. We now manage our own waste."*

In terms of waste separation, a significant majority of respondents (82.35%) stated that they do not practice separating waste at the household level, while only 17.65% indicated that they do. This is detailed in Table 4.

Table 4 : Practice of waste separation at household level

	Separation Practice	**Frequency**	**Percent**	**Cumulative Percent**
Valid	Yes	45	17.65	17.65
	No	210	82.35	100.00
	Total	**255**	**100**	

Interviews suggested that lack of knowledge, space limitations and absence of separate bins from the municipality were major barriers to waste separation. A local NGO worker noted:

> *"There is no education or support for separation. People do not even know why it is important."*

Residents echoed this, with one tenant stating:

> *"We are tenants. We just come and go; we have no space to store separated waste."*

Furthermore, only 10% of respondents reported using burying or composting, often limited to homeowners. Field observations showed that most waste bins in use were plastic and unsegregated, with mixed waste including food scraps, plastics and hazardous materials.

4.5 EFFECTIVENESS OF WASTE MANAGEMENT STRATEGIES

The second objective of the study was to evaluate the effectiveness of waste management strategies used in Old Highfield, Harare, based on key sustainability criteria namely environmental, economic and social impacts. In this study, a 5-point Likert scale was employed to assess participant's attitudes and opinions. The scale ranged from 1 to 5 with each point representing a specific level of agreement: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), 5 (strongly agree). The results are summarized in Table 5:

Table 5 : Waste management effectiveness

Statement	N	Minimum	Maximum	Mean	Std. Deviation
The local waste management system effectively manages waste	255	1	5	2.21	0.97
Waste collection occurs frequently and on schedule	255	1	5	2.05	0.89
My household experiences difficulties in proper waste disposal	255	1	5	4.12	0.83
Waste disposal methods in my area contribute to environmental pollution	255	1	5	4.34	0.78
Community-based waste management initiatives exist in my area	255	1	5	1.91	0.81

The results indicated widespread dissatisfaction with local waste management, with low mean scores for effectiveness (2.21) and collection reliability (2.05). In contrast, participants strongly agreed that they face difficulties in proper waste disposal (mean = 4.12) and that current methods contribute to environmental pollution (mean = 4.34). These quantitative findings were strongly reinforced by qualitative data from interviews. A municipal officer acknowledged systemic weaknesses, stating,

"Our collection service is irregular because we lack fuel and operational vehicles. Sometimes we skip weeks."

One frustrated resident echoed this, saying,

"We have given up on the waste. No one is coming to collect it."

A community leader also highlighted the absence of coordinated efforts, noting,

"People just try on their own. There is no coordination or support from the Council."

Waste management in the suburb was characterized by overflowing bins, widespread open dumping, and frequent open burning, observed in various locations including behind schools and along storm water drains.

4.6 EFFECTS OF WASTE MANAGEMENT STRATEGIES

The third objective of the study aimed to identify the health, social, economic and environmental effects of household solid waste management strategies currently used in Old Highfield. Descriptive statistics for each statement are presented in Table 6 below:

Table 6 : Effects of household waste management

Statement	N	Minimum	Maximum	Mean	Std. Deviation
Improper waste disposal has led to increased pests and diseases	255	1	5	4.36	0.76
Waste pollution has negatively affected my community's health	255	1	5	4.28	0.81
Poor waste management contributes to economic challenges in my area	255	1	5	4.11	0.88
The waste problem has created social conflicts in my community	255	1	5	3.72	1.04

The quantitative data shows strong agreement among residents that waste management issues in Old Highfield have serious health, economic, environmental, and social consequences. The highest concern was the rise in pests and diseases due to improper disposal (mean = 4.36), followed by health impacts (mean = 4.28), while economic and social effects were also noted (means = 4.11 and 3.72, respectively). These findings were reinforced by insights from interviews. A local clinic nurse explained,

> *"We are seeing more cases of diarrhoea and skin infections, especially among children, due to exposure to uncollected garbage and flies."*

One resident lamented:

> *"Rats and flies are running riot in the garbage. It is causing our children to get sick all the time."*

The environmental impact was evident during field observations, which showed large heaps of uncollected waste along roadsides (see Appendix 4) and near water drains (see Appendix 4), creating breeding grounds for mosquitoes, flies and rodents. From an economic perspective, several interviewees highlighted how poor waste conditions affect livelihoods. A vendor near Highfield shops noted:

> *"Customers do not want to buy food where there is a smell of garbage. Our business has dropped."*

Socially, interviewees described rising tensions between neighbors, especially where waste was dumped near shared spaces. One community leader said:

> *"Waste is causing arguments between landlords and tenants. Some people dump waste near others' yards."*

Observations further confirmed that limited space in shared residential plots, especially among tenants, meant that many were forced to improperly store or dispose of waste in nearby open spaces.

4.7 RECOMMENDATIONS FOR SUSTAINABLE WASTE MANAGEMENT

Participants responded to statements related to potential solutions for improving household waste management in the area. Table 7 presents the descriptive statistics for each of the statements.

Table 7 : Proposed waste management improvements

Statement	N	Minimum	Maximum	Mean	Std. Deviation
Improved waste collection services can enhance waste management	255	2	5	4.49	0.66
Community awareness programs are necessary for better waste management	255	3	5	4.35	0.58
More recycling facilities should be provided	255	2	5	4.28	0.71
Government policies and regulations should be enforced	255	1	5	4.41	0.75

The highest-rated statement, with a mean of 4.49, was that improved waste collection services could enhance overall waste handling. Community education and awareness programs were also highly rated (mean = 4.35), indicating that residents recognize the importance of behavioral change and public engagement. Calls for more recycling facilities (mean = 4.28) and stronger enforcement of government policies and regulations (mean = 4.41) further highlight that both infrastructure and governance are seen as essential for a sustainable system. These insights were corroborated by qualitative data from interviews. One community leader said:

> *"Without proper bins and scheduled collection, people will continue dumping waste anywhere. We need a clear collection plan."*

Another resident emphasized the role of education, saying:

"People do not know how dangerous waste is. We need to be educated so we can change our habits.

Municipal officers echoed the importance of stronger policy enforcement, with one official stating:

"There are by-laws already, but they are not being enforced. People throw waste freely because there is no consequence."

Observational data further validated these findings. In the field, no formal recycling stations were identified, and residents appeared to lack knowledge of sorting or composting practices. Many of the waste bins in use were damaged or too small for the household sizes they served.

4.8 CHAPTER SUMMARY

On chapter 4, the major findings of the study are stated, and it is concluded that the methods of management of household waste at the Old high field are generally unsustainable and that the most frequently used methods are open dumping and burning because of intermittency of the number and irregularity of the municipal collection and the absence of the infrastructure. These strategies were also determined to be ineffective in terms of the environment, social and economic sustainability contributing to health issues, conflicts within a community and environmental deforestation. Community members were very passionate about better waste collection, education of the community, recycling capacity and putting waste laws into place. The sixth chapter gives the discussion of findings.

CHAPTER 5: DISCUSSION

5.0 INTRODUCTION

This chapter includes an exhaustive analysis of the findings of the research mentioned in Chapter 4 in the context of its objectives, the existing studies, and the overall framework of sustainable development. It also questions the performance, issues and relevance of the existing waste management operations and determines how this practice meets the sustainability objectives of the environment, society as well as the economy. Reflexion concerning the contribution of institutional support, community participation and policy enforcement on how waste is managed also influences behaviors as is indicated in the chapter.

5.1 DEMOGRAPHIC CHARACTERISTICS

Demographic results indicate that the study was mostly composed of households' women as a gender-based dimension of domestic waste management in Old Highfield, hence the demographic evidence implies gender-sensitive interventions to enhance inclusionary and equitable waste management practices (Hung, 2024). Most of those who took part in the survey were in the age bracket of 26-45, the group most actively engaged in managing houses, and thus are the main resource to awareness and behavior operation campaigns. The number of households was not uniform, with the majority of families containing 4 to 6 people (54.1%), whereas others were larger (24.7%), meaning that the waste generating capacity of households differs widely and, therefore, should be addressed through different approaches like community collection point or proper education. Education was good with more than 77% of people having received secondary-level education indicating that there is a good basis of the news being disseminated based on the level of education of people even though the target group communicated to cannot be left out since they only received primary education or no education at all. Data on work revealed that there was a huge problem of unemployment (38%), while the population was significantly high in those who were self-employed (33%), indicating the economic vulnerability to the need for affordable waste treatment and also creating avenues to incorporate the community-based waste plans with some income generating activities such as recycling and composting.

5.2 HOUSEHOLD WASTE MANAGEMENT STRATEGIES

The results of the present study present a complete scenario of household solid waste management practices in the location of Old Highfield in the city of Harare, allied to the results of how

householders of this place are managing solid waste in a manner that is consistent and inconsistent with the concepts of sustainable development. Based on the Systems Theory, Sustainable Development Theory and Waste Management Hierarchy, it was possible to observe that although residents tried to implement different tactics to handle household waste, the most common patterns open dumping and burning are not only uneconomical but also potentially harmful ecologically, socially and health wise.

Based on the systems theory, inefficiencies in Old Highfield represents a collapsing of mechanisms in a multi-pronged system. The absence of proper reliable waste collection services by the Harare City Council which is illustrated in the fact that 58 percent of the respondents experienced irregular collection places the burden on the household due to pressure in the waste flow cycle. Such impairment results in decentralized and usually informal coping skills like dumping and burning. These practices are no independent choices, but movements influenced by poor policy regulation and enforcement and limited infrastructure and socio-economic capacity, all of which make the entire system frail. The connections that are being highlighted by the systems theory means that any intervention should not just focus on the households' practices but also the ability of the various municipalities in delivering services, community education, and adherence of policies (Von Bertalanffy ,1968).

In relation to the Sustainable Development Theory, the findings expose a clear misalignment between current waste management practices and the sustainable development goals (SDGs), particularly those related to health (SDG 3), sustainable cities (SDG 11) and responsible consumption and production (SDG 12). The widespread use of open dumping and burning has led to environmental degradation, including soil and air pollution, which were visibly confirmed during field observations. Residents' testimonies such as " we burn our waste ourselves" highlight the normalization of hazardous practices that threaten community health and well-being. This is compounded by economic vulnerability; as one interviewee noted, informal vendors operating near dumpsites face reduced business and health risks, illustrating the socio-economic impact of poor waste governance.

The findings highlight the critical role of socio-economic factors in shaping household waste management practices in Old Highfield, with tenancy emerging as a major structural barrier. Tenants reported limited control over their environments and inadequate space for practices like

composting and waste separation, illustrating how housing conditions influence environmental behavior and challenge conventional behavioral models. This aligns with the need for waste management strategies that address socio-economic constraints rather than assuming uniform capacity for sustainable behavior. Comparatively, similar challenges have been documented in urban settlements like Kibera, Nairobi and parts of Lagos, Nigeria, where informal dumping and burning are prevalent due to weak infrastructure and poor municipal services (Ben, 2022; Otundo Richard, 2024). However, these contexts also demonstrate the potential effectiveness of localized, community-based interventions when supported by education, tools and coherent policies. The findings underscore the need for a comprehensive, integrated waste management approach in Old Highfield.

5.3 EFFECTIVENESS OF WASTE MANAGEMENT STRATEGIES

The second objective of the study evaluated the effectiveness of household solid waste management strategies in Old Highfield, Harare, across environmental, economic and social sustainability dimensions. The findings revealed a dysfunctional system that fails to meet the core tenets of sustainable development. Quantitative data showed widespread dissatisfaction with municipal waste services, with mean scores of 2.21 and 2.05 for system effectiveness and collection frequency, respectively. Interviews with residents and officials confirmed that logistical issues such as a lack of fuel and waste collection vehicles hamper service delivery, aligning with previous studies in African cities (Debrah, Teye & Dinis, 2022; Mukwevho, Radzuma & Roos, 2024). These limitations have led households to adopt informal, unsustainable practices like burning and dumping.

Environmentally, the current disposal methods are hazardous and harmful. A high percentage of residents reported difficulties with proper disposal (M = 4.12), often resorting to burning waste in overcrowded residential areas. This not only contaminates air and soil but also exposes communities to health risks, echoing findings from Ben (2022) in urban Nigeria. The strong agreement with the statement “Waste disposal methods contribute to environmental pollution” (M = 4.34) shows that residents are aware of these impacts. However, awareness alone has not resulted in widespread adoption of sustainable alternatives such as composting or recycling, largely due to a lack of supportive infrastructure, inadequate public education and limited space particularly for

tenants. These findings support Weligama Thuppahige and Babel's (2022) assertion that enabling environments are essential to turn awareness into action.

Socially, the system discriminates unproportionally not only against renters, which comprise a large population of the population, but also do not have the independence and means to pursue sustainable practices in terms of waste. Only a tenth of the households said that they used composting or burying options which were mostly accessible to homeowners. This is an injustice that weakens the social sustainability of an inclusive environmental governance. According to Ebrahimi-Moghadam and Farzaneh-Gord (2023), waste systems in informal or low-income environments exist in an ineffective and disunite organization unless they are a result of participatory planning. But theoretically speaking, the results highlight failure to maintain the balance of the three pillars of the Sustainable Development Theory, and breakdown in the interrelated structural components of the Systems Theory (Von Bertalanffy, 1968). Also, the preference of burning and dumping is going against the waste Management Hierarchy which insists on prevention, reuse and recycling (Gertsakis & Lewis, 2003). Another study-based response to become sustainable will be to use integrated, inclusive and context-sensitive interventions that would build institutional capacity, encourage community participation and reach out to the specific needs of renters and homeowners.

5.4 EFFECTS OF WASTE MANAGEMENT STRATEGIES

The third research problem laid its emphasis on the determination of the health, social, economic and environmental effects of the household solid waste handling strategies that are currently in place in the Old Highfield region of Harare. The results have shown that inappropriate handling of waste, especially burning and dumping guides, has serious health effects to the residents. The assertion of poor waste management, which has contributed to more pests and diseases, scored a high of 4.36 with residents indicating cases of illnesses that include diarrhoea and skin infections among children especially through contact with uncollected garbage and disease carriers like flies and rats. This is in tandem with a study conducted by Chireshe, Shabani and Shabani (2023) who associate poor solid waste management in Zimbabwe with cases of cholera, typhoid and dysentery. Side effects of the ill disposition are the physical effects on health, which points towards the necessity of more effective and sustainable waste disposal plans within households.

Economically, residents living in Old Highfield are also affected by poor waste management with the average of 4.11 score showing much concern by the residents. The informal traders and vendors cited that customers are repelled by accumulation of wastes and foul odours, which are among the factors that led to the decline of business. These results are consistent with Benitez-Bravo et al. (2021), which revealed that filthy and unhealthy waste states decrease the value of the property and dampen economic performance. Socially, there is an ever-growing conflict in the community under the inadequate sewerage systems averaging 3.72 and reported conflicts between the landlords and the tenants as well as between neighbours. Compact living blocks with inadequate capacity of waste disposal created a situation of tensions and inappropriate disposal of the waste in open areas affecting environmental health issues as well as relations with the community.

The other big effect caused by the present waste management system in Old Highfield is environmental degradation. Observations made in the field showed big piles of waste material that were not collected and more so located in areas like roads and in drainage systems, which act as breeding grounds to mosquitoes, flies and rodents. Putrified waters with garbage add to the vectors of vector-borne diseases, whereas the plastic wastes block the drains and lead to floods during the rainy seasons findings which are redefined by Krecl et al. (2021). All these interrelated impacts underscore the need to have an integrated system of waste management that shall entail waste separation, composting, recycling, waste education of communities and the enhancement of municipal services. Failure to incorporate such interventions will see the persistence of health, environmental and socio-economic challenges that negatively affect the attainment of sustainable development in Old Highfield.

5.5 RECOMMENDATIONS FOR SUSTAINABLE WASTE MANAGEMENT

The fourth goal of the research was to build workable and sustainable household solid waste management solutions that were in accordance with the social-economies and environmental realities of Old Highfield. The leaders were found to be in complete agreement with the multi-faceted approach, with quantitative evidence revealing the similarity in the recommendations of all the proposed strategies to be high. Improvement of waste collection services was the most approved (mean = 4.49) and it demonstrated the previous observation that the poor collection services operated by municipalities were one of the most critical factors that had led to illegal

dumps and burns. This is corroborative of the findings by previous researchers such as Amato and Togo (2021) and Chireshe et al. (2023) who associate feeble waste collection with marginal and environmentally risky disposal activities. Likewise, it could be seen that community awareness programs has a high score (mean = 4.35), meaning that there is a great interest in specific public education. The interviews also showed evidence that the residents were aware of their knowledge gap and that they needed some guidance regarding environmentally sustainable activities such as composting and recycling, which is consistent with the findings of Leknoi et al. (2024) as far as civil engagement in the governance of waste in cities is concerned.

The implementation of official recycling infrastructure was also on the list of residents as important (mean = 4.28) because its lack makes them unable to perform environmentally friendly behavior. This would go in line with the Hierarchy of Waste Management which instead of having disposal first, the emphasis is on having reduction, reuse, and recycling (Gertsakis & Lewis, 2003). Discussion of the enforcement of environmental regulations was also well scored (mean = 4.41), with community members and officials pointing at the disparity between the presence of the policies and their practical implementation, as cited by Chireshe et al. (2023). The material support and training initiatives in the form of assistance provided by the government were also demanded, and it proves the importance of the integrated response. These discoveries justify the use of the System Theory (Von Bertalanffy, 1968), which stresses inter-relatedness between municipal services, behavior of the community, enforcing policies, and infrastructure. Finally, the paper recommends an all-encompassing, community-based and government-enhanced approach consonant to SDG 11 (sustainable cities and communities) and SDG 12 (responsible consumption and production) so that Old Highfield may be sustainable in the long term.

5.6 CHAPTER SUMMARY

This chapter critically reviewed the household solid waste management in Old Highfield, Harare, by applying sustainability concepts and concepts like Systems Theory, Sustainable Development Theory and the Hierarchy of Waste Management. Widespread practice of unsustainable activities such as dumping and burning and poor municipal services as well as poorly used recycling and compost have been key issues that have been identified. It was also noted that inefficient waste management has great health, social and economic implications. Respondents were quite supportive towards better waste collection systems, educating the community members, useful

infrastructure and enforcing the policies strongly. Chapter 6 will give the study of conclusions and recommendations.

CHAPTER 6:
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 SUMMARY

Chapter One of the study introduces the issue of household solid waste management (HSWM) in Old Highfield, Harare, contextualizing it within global and local waste management challenges. Zimbabwe's rapid urbanization, weak infrastructure, and limited municipal capacity have led to widespread issues such as uncollected waste, illegal dumping, and public health risks. The study stresses the importance of sustainable waste practices in achieving Sustainable Development Goals (SDGs), particularly in low-income urban areas. Despite existing legislation, there remains a knowledge gap regarding household waste behaviors in Old Highfield. The study aims to address this by identifying current practices, evaluating their effectiveness and impacts, and proposing sustainable, community-based solutions. Its significance lies in its potential to inform policy, improve local waste management, and promote SDG implementation.

Chapters Two to Four provide the foundation, methodology, and key findings of the research. The literature review in Chapter Two frames HSWM through Systems Theory, Sustainable Development Theory, and the Waste Management Hierarchy, underscoring the need for integrated and preventative waste practices tailored to local contexts. It reveals that while global progress exists, countries like Zimbabwe struggle with policy implementation and infrastructure gaps, resulting in environmental degradation, health risks, and missed economic opportunities. Chapter Three details the mixed-method approach used to collect data from 307 households via surveys, interviews, and observations, ensuring both depth and representativeness. Chapter Four presents findings showing that while residents are generally informed, socio-economic constraints and inadequate municipal services result in unsustainable practices like open dumping and burning. Only 15% of waste is formally collected, and satisfaction with current strategies is low. The study concludes that effective waste management in Old Highfield requires better infrastructure, increased public awareness, and stronger policy enforcement, with community support evident for more sustainable and inclusive solutions.

6.2 CONCLUSION

In conclusion, household solid waste management in Old Highfield, Harare, is predominantly informal, inconsistent, and environmentally unsustainable, with 36% of households resorting to open dumping and 26% to burning, while only 15% benefit from formal municipal collection.

These unsound practices are fueled by inadequate infrastructure, unreliable service delivery, and poor enforcement of waste regulations. Socio-economic constraints such as high unemployment (38%), overcrowded housing, and the prevalence of rented accommodation severely limit residents' capacity to engage in sustainable practices like composting, waste separation (reported by only 18%), and recycling. Despite over 75% of respondents having attained at least secondary education and the majority being women aged 26–45 systemic barriers hinder effective participation. Yet, the study revealed a strong willingness among residents to adopt improved waste management behaviors, as evidenced by high support for municipal upgrades (mean = 4.49) and growing dissatisfaction with current systems (mean satisfaction scores below 2.5). Furthermore, the negative impacts of poor waste disposal such as increased pests and disease (mean = 4.36), environmental degradation, and community tensions demonstrate that this is not merely an environmental issue but a multifaceted development concern. To address these challenges, future interventions must be holistic, combining infrastructure development, strict policy enforcement, gender-sensitive education programs, and mechanisms for participatory governance. Without such coordinated and inclusive strategies, there is a high risk of perpetuating ineffective practices, even under well-meaning reforms.

6.3 RECOMMENDATIONS

1. The city council of Harare also needs to increase the frequency and consistency of its waste collection services in Old Highfield. This entails fixing or obtaining more waste collection trucks, offering planned services and making sure that all the neighborhoods are frequently avoiding illegal dumping and burning.
2. The local governments ought to embark upon community enlightenment and environmental awareness activities in facilitating the correct methods in handling waste matters. Such campaigns must be all inclusive by employing local languages, cultural appropriate materials that target people with different education levels especially the youths, women and tenants.
3. The government with the local council should assist with an infrastructure to separate waste and recycle it across the households. This will entail the supply of colored barrels, special drop-off sites and reward of sorting the recyclable and organic waste.

4. Policy enforcement should be strengthened through updated waste management by laws and consistent penalties for non-compliance. Authorities must actively enforce existing regulations while also offering community members support and training on legal and sustainable waste disposal practices.
5. Community-based waste management initiatives should be established and supported. This can include empowering local groups, women's associations and unemployed youth to participate in composting, recycling and collection schemes, potentially creating green jobs and boosting economic resilience.
6. Future studies should explore waste management practices in other high-density suburbs in Harare or across Zimbabwe. Comparative research could identify patterns and context-specific challenges, aiding the development of regionally tailored policies.
7. Qualitative research focusing on the perceptions and experiences of marginalized groups (e.g., tenants, informal traders, women, youth) should be undertaken. This could help uncover hidden barriers to sustainable waste practices and reveal culturally grounded solutions.

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LIST OF APPENDICES
BINDURA UNIVERSITY

APPENDIX 1: QUESTIONNAIRE

HOUSEHOLD SOLID WASTE MANAGEMENT STRATEGIES IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

Instructions: Thank you for participating in this study. This questionnaire aims to gather information on household solid waste management strategies in Old Highfield. Your responses will remain confidential and used solely for academic purposes. Please answer all questions honestly. For rating-scale questions, tick (✓) the option that best represents your opinion.

Section A: Demographic Information

This section collects background information to understand the respondents' profiles.

Item No	Question	Coding Category
01	Gender	1. ☐ Male 2. ☐ Female
02	Age	1. ☐ 18-25 2. ☐ 26-35 3. ☐ 36-45 4. ☐ 46-55 5. ☐ 56 and above
03	Household Size	1. ☐ 1-3 members

		2. ☐ 4-6 members 3. ☐ 7 or more members
04	Education Level	1. ☐ No formal education 2. ☐ Primary education 3. ☐ Secondary education 4. ☐ Tertiary education
05	Employment Status	1. ☐ Unemployed 2. ☐ Self-employed 3. ☐ Formally employed

Section B: Household Waste Management Strategies

This section seeks to understand the waste disposal methods used by households.

Item No	Question	Coding Category
06	How do you primarily dispose of your household waste?	1. ☐ Municipal collection 2. ☐ Open dumping 3. ☐ Burning 4. ☐ Composting 5. ☐ Recycling 6. ☐ Other (Specify) _____
07	How often is waste collected from your household?	1. ☐ Daily 2. ☐ Weekly 3. ☐ Bi-weekly 4. ☐ Monthly 5. ☐ Irregular
08	Do you practice waste separation at home?	1. ☐ Yes

		2. ☐ No
09	If yes, what categories do you separate?	1. ☐ Organic waste 2. ☐ Plastics 3. ☐ Paper/Cardboard 4. ☐ Glass 5. ☐ Metals 6. ☐ Other (Specify) _____
10	Are there any community-based waste management initiatives in your area?	1. ☐ Yes 2. ☐ No 3. ☐ Not sure

Section C: Effectiveness of Waste Management Strategies

This section evaluates the efficiency of current waste management practices.

Item No	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11	The local waste management system effectively manages waste.	☐	☐	☐	☐	☐
12	Waste collection occurs frequently and on schedule.	☐	☐	☐	☐	☐
13	My household experiences difficulties in proper waste disposal.	☐	☐	☐	☐	☐
14	Waste disposal methods in my area contribute to environmental pollution.	☐	☐	☐	☐	☐

15	Community-based waste management initiatives exist in my area.					

Section D: Effects of Waste Management Strategies

This section explores the health, social, economic and environmental impacts of current waste disposal practices.

Item No	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
16	Improper waste disposal has led to increased pests and diseases.	☐	☐	☐	☐	☐
17	Waste pollution has negatively affected my community's health.	☐	☐	☐	☐	☐
18	Poor waste management contributes to economic challenges in my area.	☐	☐	☐	☐	☐
19	The waste problem has created social conflicts in my community.	☐	☐	☐	☐	☐

Section E: Recommendations for Sustainable Waste Management

This section aims to identify potential strategies for improving household waste management.

Item No	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
20	Improved waste collection services can enhance waste management.	☐	☐	☐	☐	☐

21	Community awareness programs are necessary for better waste management.	☐	☐	☐	☐	☐
22	More recycling facilities should be provided.	☐	☐	☐	☐	☐
23	Government policies and regulations should be enforced.	☐	☐	☐	☐	☐

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APPENDIX 2: INTERVIEW GUIDE

Introduction: Good day. My name is Patrick Ali, a Masters student at Bindura University and I am conducting a study on household solid waste management strategies in Old Highfield Suburb as part of my research on sustainable development. Your responses will be confidential and used solely for academic purposes. This interview will take about 30-45 minutes.

1. Can you describe how you manage waste in your household?
2. What waste disposal methods are most commonly used in your community?
3. Do you or your neighbors engage in recycling or composting? If yes, how? If no, why not?
4. How would you assess the effectiveness of current waste management services in Old Highfield?
5. What challenges do you experience in waste disposal?
6. What role do you think local authorities play in waste management?
7. Have you noticed any environmental or health problems caused by waste disposal in your area?
8. What social or economic impacts have resulted from improper waste management?
9. In your opinion, what can be done to improve household waste management in Old Highfield?
10. What support would you need from the government or community to manage waste more effectively?

Thank you for your time and insights. Your responses are valuable for improving waste management strategies in your community. Would you like to add anything else related to waste management before we conclude?

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APPENDIX 3: OBSERVATION GUIDE

Objective

To observe and document real-time waste management behaviors in Old Highfield Suburb, focusing on waste disposal practices, waste collection and illegal dumping activities. This guide will be used to ensure consistency and comprehensiveness in observations.

Observation Checklist

1. Waste bins availability and condition

- Are waste bins provided in households or public spaces?
- Are the bins intact, clean and functional?
- Are they covered bins, open bins, or recycling bins?
- Are bins easily accessible to residents? Are they situated at convenient locations for waste disposal?

2. Frequency of waste collection

- Is waste collected regularly? What is the frequency of collection (e.g., daily, weekly)?
- Are there any instances where waste collection is missed or delayed?
- Are households following the collection schedule and properly placing waste for collection?

3.Waste sorting and segregation

- Are households sorting waste into categories such as recyclables, organic waste and non-recyclables?

- Are any recyclable materials (paper, plastic, metal, glass) separated for recycling or repurposing?
- Are households engaging in composting organic waste?

4. Illegal dumping and waste disposal practices

- Are there any instances of waste being dumped in unauthorized areas, such as vacant lots, streets, or waterways?
- What types of waste are typically dumped illegally (e.g., plastics, hazardous waste, bulky items)?
- Is illegal dumping occurring near official waste collection points or in areas where waste collection services are lacking?

5.Waste disposal behavior

- Are there any signs of households or individuals burning waste, particularly plastics or organic materials?
- Is waste disposed of at certain times (e.g., during late-night or early-morning hours)?
- Are community members actively involved in waste management efforts (e.g., cleaning the streets, monitoring waste disposal)?

6. Health and aesthetic impacts

- Are there any visible health risks, such as the presence of disease vectors (flies, rodents, etc.) or foul odors emanating from waste piles?
- How does waste management (or lack thereof) affect the aesthetics of public and residential spaces?

7. Community engagement and awareness

- Are there any visible efforts to educate residents about proper waste disposal or recycling (e.g., public notices, awareness campaigns)?
- Are residents participating in community-based waste management initiatives or taking personal responsibility for waste management?

APPENDIX 4: PHOTOGRAPHIC DOCUMENTATION OF HOUSEHOLD WASTE MANAGEMENT OBSERVATIONS