THESIS ABSTRACT

Master of Public Health

Adventist University of Africa

School of Postgraduate Studies

Title: RESIDENTS' PERCEPTION OF FACTORS AFFECTING SOLID WASTE MANAGEMENT PRACTICES: AN ASSESSMENT IN PLUMTREE TOWN, ZIMBABWE

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This research assesses the residents' perception of factors affecting solid waste management practices in Plumtree Town, Zimbabwe. The study revealed a medium positive correlation between stakeholder involvement and solid waste management practices, emphasizing the importance of engaging stakeholders in waste management processes to improve solid waste management practices. Furthermore, the research found that enabling factors had a medium positive correlation with solid waste management practices, underscoring the need for better infrastructure and equipment to support effective waste management practices.

The study also identified financial constraints as major obstacles to solid waste management, highlighting the significance of addressing these issues to ensure adequate resources are available to support sustainable waste management practices. Future research recommendations include expanding the sample size to include a more diverse group of residents, evaluating the effectiveness of specific interventions

aimed at improving solid waste management practices and exploring the role of technology in waste management practices.

The study suggests increasing stakeholder involvement in waste management processes, improving enabling factors such as infrastructure and equipment, and enforcing compliance with relevant legislation and regulations to create a more sustainable and efficient waste management system that benefits both the environment and the community. Despite some limitations limited time frame which may not reflect changes in solid waste management practices or factors affecting them that may occur in the future, this research provides valuable insights into the perception of residents regarding solid waste management practices in Plumtree Town, Zimbabwe, and identifies key areas for future research.

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A thesis

presented in partial fulfillment

of the requirements for the degree

Master of Public Health

by

Yvonne Duduzile Ndiweni

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Dedicated to my late parents, Timothy Ncube, and Joyce Gorejena, brothers, and sisters, to my loving husband, Bhekimpi. G. Ndiweni, and my wonderful children, Luthando and Luloyiso Ndiweni, who supported me in every way to achieve this goal.

TABLE OF CONTENTS

LIST OF TABLES

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Finally, yet importantly, my family the Ncube and the Ndiweni' for all the prayers and support.

CHAPTER 1

INTRODUCTION

Background of the Study

Waste management is the separation of industrial and household unwanted materials that are placed in sanitary landfills or dumps, incineration, or recycling (Levine, 2018). According to the UN-Habitat (2018), an estimation of 1.7 to 1.9 billion metric tons of municipal solid waste (MSW) is generated universally each year. Waste production will continue to rise by 70% (3.40 billion metric tons) if existing environments continue to be affected by the current rate of urbanization and population expansion by 2050, (Cody, 2018; Kaza, Yao, Van Woerden, and Bhada-Tata, 2018). According to a report by Cody in 2018, the World Bank has estimated that only 13.5% of the waste generated globally is recycled and 5.5% is composted. Additionally, over one-third of the waste is not being managed properly, resulting in dumping, or burning in public areas.

Africa is viewed as an underdeveloped region in the globe with 38% urbanization (Cody, 2018). Godfrey et al. (2019) mention that while the percentage of waste generated in African countries may be low compared to many other countries in the world, these nations are currently experiencing rapid development, with an annual growth rate of 4%. Despite this growth, the volume of waste generated in African countries remains comparatively lower than that of developed countries. Kubanza & Simatele, (2020) assert that mismanagement of solid waste in Africa is having adverse effects on both human and environmental health. Despite this, the continent is expected to undergo a significant social and economic transformation in the next

century due to its rapidly growing population. All these will change consumer buying habits leading to an increase in waste (Chanza, Tevera, and Muchapondwa, 2017; United Nations Environmental Program, 2019). Bello, Ismail, & Kabbashi, (2016) highlights the developing countries face significant challenges when it comes to managing solid waste due to factors such as poverty, population growth, and urbanization. In Zimbabwean towns and cities, solid waste management has been a major issue, as noted by Chanza, Tevera, et al. (2017). The authors explain that individuals are migrating from rural to urban areas in search of employment and better living conditions. Unfortunately, the municipalities have struggled to provide adequate services to residents due to factors such as hyperinflation and lack of financial capital. 60% of solid waste in Zimbabwe is produced in cities and dumped in unused areas illegally, and this harms the environment and populations (Godfrey et al., 2019). Urban local authorities in Zimbabwe are unable to manage waste collection and recycling systems including Plumtree Town.

Most cities, in Zimbabwe, have been affected by inadequate waste management systems, and Plumtree Town is not an exemption, and this is noticeable of the level of waste dumped in open areas (Mwanza & Phiri, 2013). Studies have revealed that the careless dumping of waste and the lack of community commitment to waste management are significant concerns. Plumtree Town Council is facing challenges of collecting voluminous waste from the residential area to the dumpsite daily according to the schedule. As a result, many residents have resorted to illegal dumping and burning of waste openly, which are environmentally unfriendly methods.

Statement of the Problem

According to the Environmental Management Agency (EMA) in Zimbabwe, inadequate solid waste management is a major environmental challenge facing many urban areas, including Plumtree Town. In recent years, Plumtree Town has experienced a population increase and commercial activities, which has led to an upsurge in generation of solid waste. However, the town council's solid waste management practices have not kept pace with this growth, leading to the illegal dumping of waste in unauthorized areas.

According to the Plumtree Town Council (2021), the volume of waste sent to the landfill in 2021 was 380 tons per month, but it is estimated that an additional 120 tons of waste are illegally dumped each month. This means that nearly 24% of total waste produced in Plumtree Town is being illegally dumped, highlighting the seriousness of the solid waste management problem in the area.

Despite efforts by the Plumtree Town Council to cope with solid waste, there is still a significant amount of waste being illegally dumped in the town. The study aims to assess residents' perception of factors affecting solid waste management practices in Plumtree Town, Zimbabwe (Appendix C).

Research Questions

1. How do gender, age, level of education, and residential area relate to solid waste management practices in Plumtree Town, Zimbabwe?
2. How is solid waste being managed in Plumtree Town, Zimbabwe?
3. What is the relationship between stakeholder involvement factors, such as waste generators, regulators, service providers, and solid waste management practices in Plumtree Town, Zimbabwe?
4. What is the impact of enabling environment factors on solid waste management practices in Plumtree Town, Zimbabwe?

Hypotheses

$H1_0$: Stakeholder involvement factors do not affect solid waste management practices in Plumtree Town, Zimbabwe.

$H2_0$: Enabling Environment factors do not affect solid waste management practices in Plumtree Town, Zimbabwe.

Significance of the Study

The research may assist local authorities in assessing stakeholders' knowledge of appropriate management of solid waste practices, the impact of stakeholder involvement, and enabling environment factors affecting solid waste management practices in Plumtree Town, Zimbabwe.

Findings of this study may inform interventions to address health hazards associated with poorly managing of solid waste practices. Improper dumping of waste can lead to the spread of ailments such as cholera, typhoid fever, and other infectious diseases and degrading the environment. Therefore, the study may contribute to promoting public health and preventing illegal dumping in Plumtree Town by identifying factors that affect solid waste management practices and formulating appropriate solutions to mitigate related health risks and environmental damage. Additionally, the study may provide insights into the economic implications of poor solid waste management practices and encourage investment in sustainable waste management technologies and infrastructure. The study can be a reference for further research by the researcher or other researchers.

Conceptual Framework

The study was guided by the conceptual framework in Figure 1. Independent variables are the stakeholder involvement and enabling environment factors. These independent variables will impact the solid waste management practices (dependent

variable) through the quantity of waste produced and separation per household or capita, the frequency of waste collection, the efficiency of waste transfer and transport services, the percentage of recycled waste or reused, as well as the types of materials that are commonly recycled in the community recovery and recycling, the percentage of waste that is treated using environmentally sound methods, such as composting or anaerobic digestion, and finally the percentage of waste that is disposed of in landfills or other designated sites, as well as the level of compliance with regulations related to waste disposal.

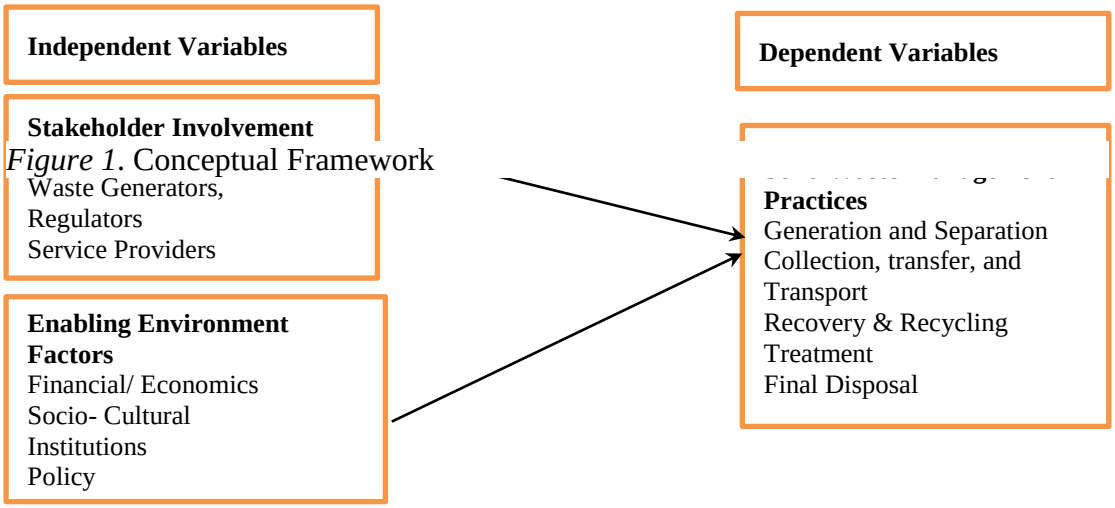

Figure 1. Conceptual Framework

Adapted from Integrated Sustainable Solid Waste Management in Asia (2009).

Scope and Limitations of the Study

This research was focusing on assessing residents' perception of factors affecting management of solid waste practices in Plumtree Town, Zimbabwe. Data was collected in Plumtree Town residence area, high, medium, and low residential areas, using an online questionnaire. The scope of the research was limited to Plumtree Town, Zimbabwe, and its solid waste management practices. The research focused on assessing the extent to which solid waste is being managed in the town

and identifying the factors that affect solid waste management practices, including stakeholder involvement and enabling factors.

The study relied on self-reported data, which may have introduced bias or inaccuracies. One possible limitation of the study was the risk of social desirability bias, which may have influenced participants to provide answers that they believed were socially acceptable, rather than expressing their genuine opinions or behaviors. It should be noted that the study was conducted within a particular time frame and may not be representative of potential future changes in solid waste management practices or factors that could impact them.

Operational Definition of Terms

Disposal- is the final waste management stage. It includes operations directed at the systematic disposal of waste products to energy installations at places such as landfills.

Onsite handling, storage, and processing- These are waste generation activities that enable easier collection. For instance, waste bins are put at locations that produce sufficient waste.

Solid waste management- It includes all phases of prevention, collection, transportation, processing (separation, compaction, incineration, drying), recycling, and final disposal and tracking of waste products to guarantee that the harmful effects of waste do not affect the quality of human life. Solid waste management relates to a variety of waste management operations and should be understood as operations such as waste generation, storage, collection, transport, processing, treatment, and disposal (Makwara and Snodia, 2013).

Solid waste management system- Waste management system includes prevention, collection system, separation system, transport system, recycling, reuse, and ultimately disposal system.

Stakeholder involvement in solid waste management refers to the active participation of individuals, groups, or organizations who have a vested interest or are affected by the management of solid waste. This includes not just residents and businesses within a community, but also local governments, waste management companies, environmental groups, and others who may have an impact on or be impacted by the management of solid waste.

Waste collection- An essential waste management activity encompasses operations such as positioning refuse collection containers, collecting waste from those containers, and accumulating waste at the place where collection trucks are emptied. Although transportation is involved in the collection phase, this is not typically the primary stage of the transportation of waste.

Waste generation- This relates to activities involving the identification of materials that can no longer be used and are either collected for systematic disposal or disposed of.

Waste processing and recovery- Refers to the facilities, machinery, and methods used to retrieve reusable or recyclable material from the waste stream as well as to enhance the efficiency of other waste management functional components.

Waste Reduction – It is the method of decreasing the quantity of solid waste produced. This involves the reuse of products, enhanced product life, reduced use of the material in product design, and reduced product consumption. Operations like grass cycling and composting of yard trimmings in the backyard are incorporated.

Waste- According to the Government of Zimbabwe (2007), waste is defined as any material, whether liquid, solid, gaseous, or radioactive, that is generated from domestic, commercial, and industrial activities and is released, emitted, or deposited in a way that causes pollution, either in terms of its quantity or the manner of its disposal.

Waste transfer and transport- These are the activities that involve transferring the waste from local waste collection sites to regional waste disposal sites in waste collection trucks.

CHAPTER 2

LITERATURE REVIEW

The provision of waste management services is crucial for most local authorities. Monitor and regulate current waste management technologies while enhancing the current scheme, solid waste must be defined by sources, generation rates, and types of waste. These processes in developing countries, have no or less suitable technology for processing and disposing of solid waste produced thereof, hence leading to a crisis due to environmental pollution and damage to public health (World Bank, 2021). Nonetheless, not all this solid waste is collected and transported to the final collection site or dump site, either because of a lack of resources or inadequate facilities. Such accumulation can cause severe health impacts and many other environmental problems (United Nations Environmental Program, 2019).

The importance of solid waste management can be seen in several key areas:

1. Environmental protection: Solid waste management helps prevent the release of toxic chemicals and pollutants into the environment, which can harm wildlife and ecosystems (Thomas, 2022).
2. Public health: Proper solid waste management helps prevent the spread of disease and protect public health by controlling the spread of harmful pathogens and reducing exposure to hazardous materials (World Bank, 2021).
3. Resource conservation is another significant benefit of solid waste management, as it involves the recovery and recycling of waste materials, thereby reducing the need for new raw materials to be extracted from the environment (Thomas, 2022). This can help preserve natural resources, reduce energy consumption, and lower greenhouse gas emissions.
4. Economic benefits: Solid waste management can create job opportunities and generate revenue through the sale of recycled materials and the operation of waste management facilities.

5. Community development: According to Chanza, Nyahuye, & Moyo, (2017), waste management can play a vital role in the overall development of a community by promoting clean and healthy living conditions, thereby enhancing the quality of life for residents.

Therefore, solid waste management is an important and complex field that plays a critical role in promoting sustainable development and protecting public health and the environment.

Historical Evolution of Solid Waste Management Practices

Historical evolution of solid waste management practices can be traced back to early human societies, where waste was simply discarded in the streets or dumped in nearby rivers. However, as populations grew and urbanization increased, this approach became unsustainable and led to serious environmental and public health problems. In response, practices to management solid waste have evolved to address these challenges. Key milestones in the history of solid waste management include:

1. 19th century: In the 1800s, cities began to establish organized waste collection systems to control the spread of disease. This was the beginning of modern practices to manage solid waste.
2. 20th century: In the early 1900s, cities started to adopt the practice of landfilling, where waste was disposed of in designated areas and covered with soil. Sanitary landfills were developed to prevent the spread of disease and reduce environmental impacts.
3. 1960s and 1970s: With the increasing awareness of environmental problems, solid waste management practices shifted towards resource recovery and recycling. This commanded to the advance of recycling programs and the construction of materials recovery facilities (MRFs).
4. During the 1980s and 1990s, there was a significant shift in focus within the field of solid waste management towards reducing the amount of waste generated, which was achieved through the implementation of waste reduction and source reduction programs (EPA, 1970). This period was also characterized by increased regulation, with the passage of the Resource Conservation and Recovery Act (RCRA) in 1976 and the establishment of the Environmental Protection Agency (EPA) in 1970, which played a key role in shaping waste management policies and practices during this time.

5. 21st century: In recent years, solid waste management practices have focused on sustainability, with an emphasis on reducing waste, increasing recycling, and reducing the environmental impacts of waste disposal. This has commanded to the development of more advanced waste management technologies, such as waste-to-energy and bioreactor landfills, and the implementation of integrated waste management systems.

Today, practices of managing solid waste continue to evolve and become increasingly sophisticated, reflecting the growing recognition of the importance of reducing waste and protecting the environment.

Challenges and Issues Faced in Solid Waste Management

Despite significant advancements in the practices of managing solid waste, many challenges and issues still exist. Some of the current challenges and problems faced in management of solid waste include:

Rising waste quantities: The rapid growth of global populations and the associated increase in consumerism is leading to an upsurge in the amount of waste generated, posing a significant challenge for waste management systems (European Commission, 2020).

Inadequate collection and disposal infrastructure: In many developing countries, waste collection and disposal infrastructure are limited, leading to uncollected waste and environmental pollution.

Poor waste separation and recycling: Poor waste separation and low recycling rates result in valuable resources being lost and contribute to environmental pollution.

Landfills: Landfills are the most common method of waste disposal, but they can also pose significant environmental and public health risks, including the release of harmful chemicals and gases into the environment.

Inconsistent and weak regulations: Inconsistent and weak waste management regulations and enforcement in many countries have contributed to the persistence of illegal dumping and poor practices to manage waste, (Kaza et al., 2018).

Kaza et al. (2018) speak about the financial constraints in solid waste management: Implementing effective solid waste management systems requires significant investments in infrastructure, equipment, and personnel. This can be a challenge, particularly in developing countries and low-income communities where funding is limited.

Resistance to change: Changing attitudes and behavior towards waste reduction and recycling can be difficult, as many people are resistant to change and may not be aware of the ecological benefits of managing waste.

Climate change: Climate change and its associated impacts, such as sea level rise and increased frequency and severity of natural disasters, pose a significant challenge for solid waste management systems and the protection of waste management facilities from damage.

Addressing these challenges and issues is critical for ensuring the effective and sustainable management of solid waste, and for minimizing its negative effects on the environment and community health.

Stakeholder Involvement

Solid waste management is a challenging task for many developing countries, and Plumtree Town, Zimbabwe, is no exception. Efficient solid waste management practices are crucial for environmental health, public health, and sustainability. However, the absence of stakeholder involvement in solid waste management can hinder the achievement of these objectives. Stakeholders in solid waste management include waste generators, municipalities, and service providers. This paper reviews

the literature on stakeholder involvement in solid waste management, successful case studies, benefits and impacts of stakeholder involvement, and programs that can be implemented to encourage stakeholder participation.

According to Abba, Noor, Yusuf, Din, and Hassan (2013), stakeholder involvement in solid waste management refers to the active participation and contribution of different groups of people in the planning, implementation, and management of solid waste management programs and activities. This includes waste generators, regulators, municipalities, service providers, and other stakeholders such as community organizations, non-government organizations, and residents.

As noted by Cody (2018) and the World Bank (2021), stakeholders are individuals and organizations who play a role in the effective management of solid waste and participate in initiatives aimed at promoting proper solid waste management practices. Stakeholder involvement is a key factor in the achievement of solid waste management initiatives as it helps to ensure that the activities are relevant, effective, and sustainable. By involving stakeholders, it becomes possible to tap into the expertise, resources, and perspectives of different groups and individuals to address the specific solid waste management challenges faced in a particular community or region (Trivedi and Dhanapal, 2017).

For example, waste generators can provide valuable information on the types and quantities of waste generated, which can help in the planning and design of collection, transport, and disposal systems (Wang and Lin, 2009). Regulators can provide the necessary guidance and oversight to ensure that solid waste management practices comply with local and national regulations and standards (Verma and Goel, 2017). Municipalities can provide the necessary resources, including funding, infrastructure, and personnel, to support solid waste management initiatives (Kotei,

Annang, & Yirenya-Tawiah, 2020). Service providers can provide technical expertise, equipment, and manpower to support the implementation of solid waste management activities. Bello et al., (2016) suggest that the shift from public to private institutions in the provision of various public utilities and services has prompted governments to establish robust regulatory bodies to ensure that service providers deliver effective and efficient services.

Olukanni, Adeleke, & Aremu, (2016) point out that there may be multiple organizations involved in the same type of activity or at the same level. For example, both the informal and formal sectors may be involved in recycling, or both the public and private sectors may be involved in municipal waste collection and transport. With stakeholders' involvement in the solid waste management process, it becomes possible to create a more comprehensive, inclusive, and participatory approach to addressing solid waste management challenges (Verma and Goel, 2017). This can lead to increased ownership, accountability, and commitment to the solid waste management program, which can help to ensure its long-term sustainability.

Stakeholder Involvement in Solid Waste Management

Stakeholders in managing of solid waste play significant roles in ensuring efficient waste collection, transportation, and disposal. Waste generators, for instance, have a crucial responsibility of reducing waste generation and sorting waste at the source to facilitate recycling and reuse. Municipalities are responsible for developing solid waste management policies, providing resources and facilities for waste collection, transportation, and disposal, and monitoring compliance. Service providers, such as waste collection companies, are responsible for collecting waste from the generation point and transporting it to the disposal site.

According to Kumar et al., (2017), stakeholder involvement in the management of solid waste is essential for the success of waste management programs. They argue that stakeholder participation can improve the effectiveness of waste management practices by promoting waste reduction, recycling, and composting. Furthermore, stakeholder involvement can increase accountability and transparency in solid waste management practices.

Success Stories of Stakeholder Involvement in Solid Waste Management

Several successful case studies demonstrate the effectiveness of stakeholder involvement in the practices of managing solid waste. One example is the zero-waste program in San Francisco, USA. The program involves active participation from all stakeholders, including waste generators, municipalities, and service providers, to achieve zero waste by 2020 (Lippiatt & Ardakanian, 2017). The program's success can be attributed to stakeholder involvement, which has promoted waste reduction, reuse, and recycling.

Another example is the Pay-As-You-Throw (PAYT) program in Taiwan, which has achieved high waste reduction rates (K. Wang, Zhao, Peng, and Zeng, 2020). The program involves charging waste generators based on the amount of waste generated, which has motivated waste reduction, recycling, and composting. The program's success can be attributed to stakeholder involvement, which has promoted waste reduction and responsible waste management practices.

Several countries around the world have implemented successful waste management practices through stakeholder involvement. In Japan, for example, the government has implemented a waste separation and recycling program that involves waste generators in separating the waste into categories such as burnable, non-

burnable, and recyclable waste. The program has been successful in reducing waste generation and promoting recycling (K. Wang et al., 2020). Similarly, in Curitiba, Brazil, the government has implemented a solid waste management program that involves all stakeholders. The program includes waste separation and sorting, composting, and recycling. The program has been successful in reducing waste generation, increasing recycling rates, and improving the quality of life for residents (Alberti, Figueira, Hofmann, Koschke, and Enthaler, 2019).

Benefits and Impacts of Stakeholder Involvement

Stakeholder involvement in solid waste management practices has numerous benefits, including environmental and public health, economic, and social benefits. According to Kumar et al. (2017), and Prah et al. (2019), stakeholder involvement can promote waste reduction, recycling, and composting, which reduces the amount of waste that ends up in landfills or the environment. Improved waste management practices by stakeholders will be a natural activity because they own the program and understand the benefits, such as reduced waste generation, and increased recycling rates. Engaging stakeholders can also lead to increased public awareness and education about waste management and environmental issues. This, in turn, reduces the negative environmental and public health impacts associated with poor waste management practices.

Furthermore, stakeholder involvement can promote economic benefits, such as job creation and income generation, through waste recovery and recycling. For instance, the zero-waste program in San Francisco has created jobs in the recycling, composting, and waste recovery industries (Lippiatt & Ardakanian, 2017). Moreover, stakeholder involvement can promote social benefits, such as community participation and empowerment, which can enhance social cohesion and resilience.

Stakeholder involvement can also lead to increased job opportunities and economic benefits. For example, in Brazil, the solid waste management program in Curitiba has created job opportunities for waste collectors, sorters, and recyclers (Alberti et al., 2019). Similarly, in India, the government has implemented a waste-to-energy program that involves private companies in converting waste into energy. According to Mishra et al. (2022), the implementation of the waste management program has resulted in the creation of employment opportunities and a decrease in reliance on fossil fuels. In their article, "Sustainability challenges in solid waste management in developing countries: a case study of Dhaka, Bangladesh," Hasan, Mahumud, Khan, and Abedin (2021) highlight the need for effective stakeholder involvement in solid waste management to minimize negative environmental and health impacts. They note that effective stakeholder engagement can help to improve solid waste practices, which can in turn reduce environmental pollution and improve public health.

Negative Impacts of Stakeholder Involvement in Solid Waste Management

Although stakeholder involvement in managing solid waste can bring several benefits, it can also have negative impacts. According to K. Wang et al. (2020), involving waste generators in waste separation and sorting can be challenging, especially in developing countries where waste separation and sorting are not common practices. Similarly, involving service providers can lead to conflicts of interest between private companies and municipal governments.

However, the lack of stakeholder involvement in the management of solid waste can have negative impacts. Ahmed and Ali (2021) conducted a study on stakeholder involvement in managing solid waste in Dhaka, Bangladesh, and found

that such involvement had resulted in numerous adverse environmental and health consequences. These included the release of greenhouse gases and toxic chemicals from landfills, as well as the exposure of waste pickers to hazardous working conditions and waste-borne diseases. For instance, poor waste management practices can result in environmental pollution, which can harm public health and lead to economic losses. Furthermore, poor waste management practices can lead to social conflicts and undermine community participation and empowerment.

In their review of management of solid waste management in developing countries, Kotei et al. (2020) also discuss the possible negative effects of stakeholder involvement on the environment and human health. They note that improper waste disposal by waste generators, inadequate waste collection by service providers, and inadequate regulation by municipalities can all lead to environmental pollution and health hazards.

Stakeholder involvement leads to environmental and health risks if the stakeholders do not have adequate knowledge, skills, and experience to participate effectively in solid waste management. For instance, if waste generators are not educated on the proper methods of waste disposal, they may dispose of waste in a manner that is harmful to the environment and human health. Improper waste management practices can result in the release of hazardous chemicals and pollutants into the surrounding air, soil, and water bodies, which can have significant negative impacts on the health of nearby communities.

Another potential hazard of stakeholder involvement is the exploitation of vulnerable groups. For example, waste pickers who rely on waste management as a source of income may be exploited by service providers who do not pay them fairly. This can lead to hazardous working conditions and exposure to toxic waste, which can

result in health issues such as respiratory problems, skin rashes, and other occupational hazards.

Moreover, in some cases, stakeholder involvement can result in conflicts between different groups, such as waste generators and service providers. These conflicts can lead to a breakdown in communication and cooperation, which can hinder effective solid waste management and result in negative environmental and health impacts. Overall, it is important to ensure that stakeholder involvement in solid waste management is conducted in a manner that is safe, ethical, and sustainable to minimize potential environmental and health hazards. This can be achieved through effective education and training of stakeholders, transparent communication and collaboration, and the development of policies and regulations that protect vulnerable groups and the environment.

Programs to Motivate Stakeholder Participation

Several programs can be implemented to motivate stakeholder participation in management of solid waste. One such program is the community-based waste management program, which involves active participation from waste generators.

A study done by Kgosiesele and Zhaohui (2010) in Botswana focused on stakeholder engagement contributing immensely to better water quality, waste recycling, litter abatement, and environmental awareness education at the regional level. The study specifically indicated the community's efforts through the Botswana environmental watchdog Clean Up campaign, which promotes waste minimization and avoidance, Journal of American Science,2010;6(9). Public engagement culturally transforms and is a civic interaction recommended by the World Bank and it has proven to be an essential factor in a working waste management program. The World

Bank encourages the creation of opportunities and awareness-raising programs to promote waste management, source-separation, and reuse (Levine, 2018).

Social inclusion in most developed countries, the recovery of resources relies heavily on informal workers who gather, sort and recycle 15%–20% of the waste produced (Kotei et al., 2020). Initiatives tackle waste pickers ' livelihoods through approaches for example inclusion into the formal framework, as well as the implementation of healthy working environments, social safety lines, and controls on child labor and employment. The role of the World Bank in urban waste management promotes environmental health and livelihoods by reducing open burning; alleviating the proliferation of pests and pathogens, and this can be achieved when stakeholders work hand in hand with the local authority (World Bank, 2021).

Several recent studies have discussed the issue of stakeholder involvement in solid waste management practices in developing countries. Amoah and Kosoe (2014) conducted a review of the literature on factors that influence solid waste management practices in developing countries, including stakeholder involvement. The study found that stakeholder involvement is crucial for effective waste management practices, and identified several factors that can influence stakeholder participation, such as awareness, education, and incentives.

According to Kaza et al. (2018), their report provides a global overview of solid waste management practices and underscores the necessity of stakeholder engagement in achieving sustainable waste management practices. The report highlights the significance of involving all stakeholders, including the government, private sector, civil society, and communities, to tackle the solid waste management problem. Olukanni et al. (2016) examined the duty of stakeholder involvement in managing solid waste in Nigeria. The study found that stakeholder participation is

crucial for effective waste management practices, and identified several factors that can influence stakeholder participation, such as communication, education, and trust.

N. Chanza et al. (2017)'s study examined managing solid waste in African cities, including stakeholder involvement. The study found that stakeholder participation is crucial for effective waste management practices, and identified several challenges to stakeholder participation, such as lack of resources, capacity, and coordination.

Regulators and service providers play a crucial role in ensuring proper management of solid waste, which can have a positive impact on the environment and public health. Several studies have highlighted the importance of their involvement in waste management.

For instance, a study by Kaza et al. (2018) conducted in 20 cities across six continents found that cities with a dedicated solid waste management department and strong regulatory frameworks had higher waste collection coverage and better waste disposal practices. The study also found that cities with a public-private partnership model for waste management had better service delivery than those with only public or private service providers.

Similarly, a study by Othman, Hussin, and Zainudin (2021) in Malaysia found that the involvement of municipalities in waste management led to significant improvements in waste collection, transportation, and disposal practices. The study also highlighted the importance of public awareness and education campaigns by municipalities to promote proper waste management practices among the public.

Another study by Kumar et al. (2017) in India found that the involvement of private sector service providers in waste management led to better waste collection, transportation, and disposal practices. The study also highlighted the importance of

proper regulatory frameworks and monitoring by municipal authorities to ensure compliance with environmental and health standards.

Overall, the involvement of regulators and service providers in waste management can lead to improved waste management practices, which can have positive impacts on the environment and public health.

In developed countries, waste generators, municipalities, governments, and service providers play important roles in proper solid waste management. Waste generators are responsible for sorting their waste into different categories, such as recyclables and non-recyclables, and properly disposing of them. Municipalities and governments are responsible for providing waste collection services and enforcing regulations and policies to ensure proper waste management. Service providers, such as waste management companies, are responsible for collecting, transporting, and disposing of waste in an environmentally safe manner.

According to a study by Silva, Costa, Costa, and Leite (2020), developed countries have implemented effective waste management strategies such as the "waste hierarchy" approach, which prioritizes waste reduction, reuse, and recycling before resorting to disposal. In addition, developed countries have invested in advanced waste management technologies, such as waste-to-energy incineration and landfill gas recovery, which can help reduce the amount of waste that ends up in landfills and mitigate greenhouse gas emissions.

Silva et al. (2020), argue that government policies, such as landfill taxes and recycling incentives, can play a significant role in promoting proper solid waste management practices in developed countries. They suggest that these policies can encourage waste generators and service providers to reduce waste generation, increase recycling, and adopt more sustainable waste management practices.

Overall, waste generators, municipalities, governments, and service providers in developed countries have a shared responsibility to ensure proper solid waste management practices. By implementing effective waste management strategies and investing in advanced technologies, developed countries can reduce the environmental and health impacts of waste and create a more sustainable future.

Waste generators' role, municipalities, government, and service providers in Africa regarding proper management of solid waste is a critical issue that has been discussed by many scholars in recent years. In comparison to developed countries, African countries are facing more significant challenges in managing their waste due to inadequate infrastructure, limited resources, and low levels of public awareness.

According to Abubakari, Koranteng, and Asamoah (2020), waste generators in African countries play a significant role in proper solid waste management by segregating their waste at the source and reducing waste generation through sustainable practices. However, the lack of awareness and incentives for proper waste management practices remain significant challenges in many African countries.

Municipalities and government agencies also have a critical role to play in managing solid waste. According to Kaza et al. (2018), the effectiveness of managing solid waste in African countries largely depends on the political will and institutional capacity of local governments. Inadequate funding, poor planning, and corruption have been identified as significant challenges in many African countries.

Service providers, including private companies and non-governmental organizations, also play a crucial role in managing solid waste in African countries. According to Kaza et al. (2018), private sector involvement can improve waste collection and disposal efficiency and help generate revenue from recycling and other waste management activities. However, the lack of regulatory frameworks and limited

investment in waste management infrastructure remain significant challenges in many African countries.

Overall, African countries encounter substantial difficulties in managing their solid waste when compared to developed countries, owing to insufficient infrastructure, limited resources, and low levels of public awareness. Nevertheless, there is a growing acknowledgment of the importance of enhanced waste management practices and the participation of all stakeholders, including waste generators, municipalities, government agencies, and service providers, in addressing this problem.

In conclusion, these studies provide insights into the importance of stakeholder involvement in management of solid waste in developing countries and highlight the need for effective stakeholder engagement strategies to achieve sustainable waste management practices. Stakeholder involvement is a critical aspect of solid waste management and plays a key role in ensuring the success and sustainability of solid waste management initiatives.

Historical Evolution of Stakeholder Involvement in Solid Waste Management

Stakeholder involvement in solid waste management has evolved in response to changing social, environmental, and economic conditions. Initially, solid waste management was considered primarily a responsibility of local governments. Over time, however, the role of stakeholders has become more diverse, with various private and public actors taking on more responsibility for solid waste management practices.

In the early days of solid waste management, waste generators, and local governments were the primary stakeholders. Governments would collect and dispose of waste, with little input from the waste generators. However, as environmental

concerns and regulations increased, the involvement of other stakeholders, such as environmental regulators and service providers, became more important.

During the 1980s and 1990s, there was a growing awareness of the significance of private sector participation in solid waste management. This was driven by the rising expenses associated with waste management and the demand for more efficient and effective waste management practices. The private sector was recognized as having the necessary skills and resources to manage solid waste in a more sustainable and cost-effective manner.

In recent years, there has been a growing emphasis on stakeholder collaboration in solid waste management. This has involved the development of partnerships between various stakeholders, including waste generators, regulators, municipalities, and service providers, to promote more sustainable and effective solid waste management practices.

In conclusion, the historical evolution of stakeholder involvement in solid waste management has been characterized by an increasing recognition of the importance of private sector involvement, as well as a growing emphasis on collaboration between stakeholders. It is expected that this trend will continue in the future, as the challenges associated with solid waste management continue to evolve and become more complex.

Types of Stakeholders Involved in Solid Waste Management and Their Roles

Stakeholder involvement is a critical component of effective solid waste management practices. The different types of stakeholders involved in solid waste management include waste generators, regulators, municipalities, and service providers.

Waste generators refer to the individuals, households, institutions, and industries that produce solid waste. These stakeholders play a significant role in reducing the volume of waste generated and ensuring proper waste separation and disposal practices. Waste reduction refers to the steps taken by waste generators to minimize the amount of waste they produce at source. According to Kaza (2020), reducing the usage of single-use products, adopting a circular economy approach, and promoting environmentally friendly materials are some of the ways to achieve sustainable solid waste management. At the household level or a community level, (community health clubs, or school health clubs) it will give the best results. Solid waste processing is an innovative approach that allows waste generators to manage their waste in a more sustainable manner (Gana, Babanyara, and Abdulkadir, 2022).

Instead of viewing waste as an unwanted thing that needs to be discarded, trash can be viewed as a resource that has great value. Solid waste processing looks at the recovery of reusable and recyclable materials and minimizes strategies, which is best done at source, (separation at source). Waste disposal refers to the safe and proper disposal of residual waste that cannot be recycled or composted (United States Environmental Protection Agency, 2018). Waste generators play a key role in this process by properly disposing of their waste through the designated waste collection systems. Involvement of waste generators can be improved through public education and awareness campaigns, the provision of incentives, the creation of supportive infrastructure, and encourage responsible waste management behaviors (Verma and Goel, 2017).

Despite the potential benefits, involving waste generators in solid waste management poses several challenges. One significant challenge is the lack of motivation among waste generators to participate in waste management practices, as it

may not be a priority for them. Another challenge is a lack of understanding of waste management processes, which can lead to incorrect or inconsistent waste management practices. Finally, Kaza (2020) states practical limitations, such as a lack of facilities or resources to manage waste, which can make it difficult to involve waste generators effectively in solid waste management.

To overcome these challenges, it is important to involve waste generators in the design and implementation of solid waste management programs and to provide them with the resources and support necessary to participate effectively. This can include education and outreach programs, incentives for waste reduction and reuse, and investment in waste management infrastructure. By working together, waste generators, regulators, service providers, and other stakeholders can ensure that solid waste management practices are effective, sustainable, and responsive to the needs of all stakeholders.

Regulators, such as government agencies and non-governmental organizations, are responsible for establishing policies and regulations related to solid waste management. They play a critical role in ensuring that waste management practices are carried out in an environmentally responsible manner (Gana et al., 2022).

Municipalities, such as local governments and town councils, are responsible for the collection, transportation, and disposal of solid waste. They play an important role in the implementation of waste management practices and the provision of waste management services to the community. Several initiatives have been taken by governments and municipalities worldwide to educate and engage waste generators in the solid waste management process. For example, in Europe, the European Commission launched a “Waste less, recycle more” campaign to encourage citizens to

reduce their waste and recycle more. In Greece, several cities have implemented “Pay as You Throw” (PAYT) systems, where households pay for the waste, they generate based on its weight or volume, which provides an incentive for them to reduce their waste (Emmanouil, Papadopoulou, Papamichael, and Zorpas, 2022; World Bank, 2021).

Moreover, there has been an increased trend toward involving waste generators in the management process through public-private partnerships (PPPs) (World Bank, 2021). PPPs are collaborations between the public sector, the private sector, and other stakeholders, where the private sector provides technical, financial, and operational expertise to the public sector. These partnerships have been effective in improving the solid waste management infrastructure and services in several cities worldwide.

Stakeholders' Responsibilities to Reduce Solid Waste Production

Each stakeholder has a role to play in managing solid waste; it is not the sole responsibility of the local authority to handle waste in urban areas. According to a 2008 report by the University of Zimbabwe Institute of Environmental Studies, Zimbabwe generates 150,000 tons of waste annually, with 70% being food waste. Unfortunately, only 10% of the total waste is composted, recycled, or reused, with the remaining 90% ending up in urban dumpsites or landfills. However, this situation can be improved if all residents become involved in proper waste management practices. For instance, waste producers can significantly reduce the amount of biodegradable waste by cooking the right amount of food to avoid leftovers, composting waste for use as manure in gardens, and separating recyclable materials for easy collection by recycling companies.

The Department for Environmental Management Agency has partnered with 75 Community-based organizations (CBOs) countrywide recycling projects, most of which have transformed lives positively through the manufacture of various artifacts from recycled material and candle production, floor polish from plastic waste and paraffin (Environmental Management Agency, 2015). There are currently a few recycling companies in Zimbabwe; however, there are vast opportunities for such 'green' projects to flourish. According to United Nations Environmental Program (2019), several initiatives worldwide have been taken by governments and municipalities to educate, engage and empower waste generators in solid waste management sustainable practices.

Sustainable solid waste management complements the concept of a green economy, and this can be described as one that leads to improved human well-being and social equity while significantly reducing environmental risks and ecological scarcity (Kaza, 2020). Greening the waste sector means moving the less desired forms of waste management and disposal to the 3Rs, reduce, reuse, and recycle. A key component of a green economy/ sustainable economy is that it aims to provide incentives for economic growth and alleviate poverty without liquidating or eroding natural assets on the land (European Commission, 2020). In conclusion, the involvement of waste generators in solid waste management is crucial, and there have been several initiatives, practices, and trends aimed at involving waste generators in the management process. These initiatives include waste separation at source, source reduction, and source segregation, education and engagement programs, and public-private partnerships.

Examples of the role of the municipality in solid waste management include:

1. Developing and implementing waste management plans and policies

2. Providing collection services, such as curbside pickup or community drop-off centers
3. Operating transfer stations, recycling facilities, and waste-to-energy plants
4. Monitoring and enforcing compliance with waste management regulations
5. Educating and involving the community in solid waste management practices

Role of Regulators in Solid Waste Management

Regulators play a crucial role in managing solid waste as they are responsible for creating and enforcing policies and regulations to ensure effective and sustainable waste management practices (Abba et al., 2013). They also oversee the activities of the various stakeholders involved in solid waste management and ensure that they follow the regulations.

The primary responsibility of regulators is to create and enforce policies and regulations related to solid waste management. These policies and regulations aim to minimize the negative impacts of waste on public health, the environment, and the economy. For example, regulators may enforce regulations related to waste generation, separation, collection, transportation, recovery and recycling, treatment, and final disposal (Le, Nguyen, and Zhu, 2018).

They also enforce regulations related to the health and safety of workers involved in waste management activities. Regulators also play a crucial role in monitoring the activities of the various stakeholders involved in solid waste management. They may inspect waste management facilities to ensure that they follow the regulations and that they are operating in a safe and environmentally responsible manner (United Nations Environmental Program, 2019).

In addition, regulators may conduct audits of waste management activities to verify that they are being carried out following the regulations. Another important role of regulators is to provide technical and financial assistance to stakeholders

involved in solid waste management. This can include providing training on best practices for waste management, funding for waste management projects, and supporting research and development of new waste management technologies.

Finally, regulators play an important role in promoting public education and awareness of solid waste management. This includes educating the public on the importance of reducing waste, properly separating waste, and participating in waste management activities. However, there are also several challenges associated with involving regulators in solid waste management. One of the main challenges is that regulations can be difficult to enforce and may not be effective if not properly enforced. Additionally, the cost of regulatory compliance can be a burden for waste management companies and communities, especially in developing countries (García-González and Reche, 2017).

Service providers, such as waste collection and disposal companies, are responsible for the physical handling and disposal of solid waste (Abba et al., 2013). They play a crucial role in the collection, transportation, and disposal of waste, and in ensuring that waste management practices are carried out in an environmentally responsible manner (Kaza et al., 2018). Studies have shown that the active involvement of all stakeholders in solid waste management can lead to improved waste management practices, greater environmental sustainability, and reduced negative impacts on human health and the environment (Sorooshian, 2013).

Benefits and Challenges of Involving Regulators in Solid Waste Management

The role of regulators in solid waste management is to create and enforce policies and regulations that ensure the proper handling and disposal of solid waste. The benefits of involving regulators in solid waste management include promoting

environmental protection, public health, and sustainability. By establishing regulations, regulators can help ensure that waste management practices are safe, effective, and meet environmental standards (Abba et al., 2013).

However, there are also several challenges associated with involving regulators in solid waste management. One of the main challenges is that regulations can be difficult to enforce and may not be effective if not properly enforced. Additionally, the cost of regulatory compliance can be a burden for waste management companies and communities, especially in developing countries (United Nations Environmental Program, 2019).

Another challenge is that there may be conflicting interests between regulators and other stakeholders, such as waste generators, service providers, and communities. This can lead to resistance from stakeholders, who may not agree with regulations that may impact their operations or bottom line.

Despite these challenges, involving regulators in solid waste management is critical for promoting sustainability and protecting public health and the environment. The involvement of regulators can help ensure that waste management practices are safe, effective, and meet environmental standards, while also promoting stakeholder cooperation and collaboration.

Enabling Environment Factors in Solid Waste Management and Their Importance

Enabling environment factors refer to the conditions, policies, and regulations that support and encourage the implementation of effective and efficient solid waste management practices. These factors can include legal and institutional frameworks, financial resources, technical capabilities, and public awareness and participation. They play a critical role in ensuring the success of solid waste management programs

and can influence the behavior of stakeholders, including waste generators, service providers, regulators, and municipalities.

The importance of an enabling environment for solid waste management is widely recognized by scholars in the field. A supportive environment can facilitate the implementation of integrated and sustainable solid waste management programs, ensure compliance with relevant laws and regulations, and promote public involvement and participation. This can help to address the social, economic, and environmental impacts of solid waste and support the achievement of wider sustainability goals.

According to a study by Kumar et al. (2017), an enabling environment is necessary to ensure the effective implementation of waste management practices, including collection, transportation, treatment, and disposal. The authors also highlight the importance of stakeholder involvement, including the involvement of the private sector, in creating an enabling environment for solid waste management.

In another study, Dinesh et al. (2020) emphasized the importance of creating a favorable policy environment for solid waste management, including the establishment of clear guidelines and regulations, the provision of financial incentives, and the promotion of public-private partnerships. The authors also noted that an enabling environment can support the development of innovative and sustainable waste management practices, including recycling and recovery programs, and help to mitigate the negative impacts of waste on the environment and public health. Creating an enabling environment for solid waste management is crucial for ensuring the success of waste management programs and mitigating the social, economic, and environmental impacts of solid waste. The importance of an enabling

environment is widely recognized by scholars and policymakers, and it is a key factor in promoting sustainable and effective waste management practices.

The enabling environment factors in solid waste management refer to the external conditions and factors that facilitate or hinder the effective implementation of solid waste management practices. These factors include financial, socio-cultural, institutional, and policy components.

Financial

Financial factors include the availability of resources, funding mechanisms, and cost recovery options, which can influence the ability of solid waste management systems to operate effectively. According to a study by Abimbola, Kolawole, and Olufunke (2017), financial factors play a critical role in the sustainability of solid waste management practices, as funding is required for investment in infrastructure, procurement of equipment, and payment of personnel.

Proper waste management is important to build sustainable and productive communities but remains a problem for many developing countries and towns. Efficient waste management is costly and often requires 20%-50% of municipal budgets (Emenike, Iriruaga, Agamuthu, and Fauziah, 2013). Operating this vital public service requires interconnected economically, sustainably, and socially supported programs. Abimbola et al. (2017), acknowledge that insufficient economic opportunities in well-equipped and well-engineered landfills are impeding the proper disposal of solid waste.

Moreover, this problem restricts operating expenditures such as wages or fuel and maintenance, or there may be a lack of capital to buy new equipment, and regular vehicles and build required environmentally friendly landfills (Kaza et al., 2018). The researchers cited several suggestions to correct this situation. This can be done by

increasing local taxes and rates (Kaza, 2020; World Bank, 2021). The implementation of tax and fee systems and long-term planning, programs help policymakers enhance the management and recovery of waste (Kaza, 2020). This might improve the open economic resource though it is opposed by many politicians. Other methods may include cost reduction, such as assessing all proposed schemes in terms of their effectiveness using a pilot basis to obtain practical values for operating parameters (Levine, 2018; World Bank, 2021).

Under the theme "waste-wise cities," the key message for the 2018 World Habitat Day was to prioritize financing for solid waste management initiatives. Urbanization creates the demand for proper solid waste and that can be channeled to improve sound waste management. The more the populations increase in urban cities the more rates are paid to the local authorities for the management of the waste. Technology and economic instruments help to harness the impact of urbanization; help capacity-building programs to reinforce solid waste management.

Legal, Administrative, and Regulatory Frameworks

These support solid waste management practices. Institutional factors can include the presence of effective legislation, enforcement mechanisms, and governance structures that promote solid waste management. According to a study by A. Kumar, Dixit, and Prabhakar, (2016), Kubanza and Simatele (2020), effective institutions are critical for the implementation of sustainable solid waste management practices, as they provide the necessary framework for planning, implementation, and enforcement.

Policy factors refer to the policies and strategies that guide solid waste management practices. These policies can include national, regional, and local

regulations, as well as plans and programs that support waste reduction, recovery, and recycling. According to a study by Chen, Bodirsky, Krueger, Mishra, and Popp (2020), policy factors play a critical role in the success of solid waste management practices, as they provide the necessary guidance for implementation and ensure the alignment of solid waste management practices with broader environmental objectives.

Regulations in Zimbabwe for Solid Waste Management National Laws

In Zimbabwe, the main statutes governing the management of solid waste are the Environmental Management Act (CAP20:27), the Urban Councils Act (CAP 29:15), the Public Health Act (CAP15:17), the Rural District Council Act, Municipal By-Laws, and various statutes such as the Statutory Instrument 6 of 2007; 98 of 2010, (Plastic Bottles and Plastic Packaging) and 4 of 2011. “All people have the right to live in a clean and healthy environment that is not harmful to their lives,” according to the Environmental Management Act (CAP20:27) (Effluent and Solid Waste Disposal) Regulations and the revised Constitution of Zimbabwe., Statutory Instrument 98 of 2010 Regulations. The Act prohibits:

> The discharge or disposal of any waste in a manner that causes pollution to the environment or ill health to any person. The transportation of waste should be under a license issued by the Agency. It also gives details of who should apply for a waste license; this includes waste transporters within Zimbabwe, operators of waste disposal sites or plants, and or generators of hazardous waste.
>
> The discarding, dumping, and leaving of litter in any place except in containers or places provided for that purpose.

It is a requirement that all waste disposal sites should be lined with appropriate lining material specific to the nature of the waste and environmental risks. Statutory Instrument 6 of 2007 compels local authorities to ensure a waste collection frequency

that minimizes accumulation and avoids decomposition of waste on collection sites as well as the preparation of waste management plans(www.ema.gov.zw).

Waste Management Statutory Instrument 6 (SI) of 2007 compliments EMA to this effect in part IV, section 12 1 b (IV) where it stipulates that all waste generators other than residential should avail of Waste Management Plans (WMP), implement them, and adhere to safety in the management processes.

The Environmental Management Authority (EMA) and the Ministry of Health and Child Care officers constantly have check-ups hence enforcing hygiene and environmental regulations. Regulating the handling of solid waste at the producers' level, collection, disposal, and treatment of waste is their major duty. Environmental Management Act requires all persons whose activities generate waste, to employ measures essential to reduce the waste through treatment, reclamation, and recycling. Chapter 15; 09 of the Public Health Act, part ix, Section 82 states that "no person shall cause a nuisance or shall suffer to exist on any kind or premises owned or occupied by him'', and Section 83 compels the local authority to keep the district sanitary, seeing to it that all nuisance is removed.

Weaknesses of the legislation. The Public Health Act transfers responsibility for waste management to waste generators at the primary level, and this creates issues because there are no consistent guidelines and practices for waste management. As a result, dumping of waste is often done in the backyards and open pits, with the mentality of out of sight out of mind and this has resulted in severe environmental issues such as the breeding of flies and the production of undesirable odors. The Public Health Act has therefore not been effective in providing adequate standards for the treatment of solid waste (Environmental Management Agency, 2019).

Socio-Cultural Factors

The values, attitudes, and beliefs of individuals and communities towards waste and waste management fall under socio-cultural factors. These factors can either support or hinder the implementation of solid waste management practices. According to a study by Ekanem, Ekanem, Eyenaka, and Isaiah (2013), positive attitudes towards waste reduction and recycling, as well as community engagement in solid waste management, can enhance the effectiveness of solid waste management practices. Some of the key socio-cultural factors that affect solid waste management include:

Attitudes and beliefs: People's beliefs about waste and the environment influence their attitudes toward waste management. For example, some people may view waste as a valuable resource that can be recycled, while others may see it as a nuisance that should be disposed of quickly.

Cultural norms and values: Cultural norms and values also influence people's behavior toward waste management. For instance, some cultures place a high value on cleanliness and orderliness, which may encourage them to dispose of waste properly.

Education and awareness: Education and awareness campaigns can help to promote better waste management practices by informing people about the environmental impacts of waste, as well as the benefits of recycling and composting.

Social and economic factors: Social and economic factors, such as income levels and access to waste management facilities, can also influence people's waste management practices. For example, people who live in low-income areas may have limited access to waste management services, which can lead to illegal dumping and other harmful practices.

Government policies and regulations: Government policies and regulations can also play a significant role in waste management. For instance, policies that promote waste reduction and recycling can encourage people to adopt more sustainable practices.

Infrastructure and technology: The availability of waste management infrastructure and technology can also impact waste management practices. For example, communities with well-developed recycling and composting facilities may be more likely to adopt sustainable waste management practices.

Community participation and engagement: Community participation and engagement are critical for promoting sustainable waste management practices. Engaging with community members through outreach and education can help to build support for waste reduction and recycling efforts.

The literature suggests that people's beliefs and attitudes toward waste and the environment are strongly linked. According to a study by Van der Werff and Steg (2016), people who hold pro-environmental beliefs are more likely to engage in waste-reduction behaviors, such as recycling and composting. Similarly, a study by (Ekanem et al., 2013), found that people's attitudes towards waste management were strongly influenced by their beliefs about the importance of environmental protection. Furthermore, research has shown that environmental education and awareness-raising programs can play a crucial role in shaping people's attitudes and beliefs toward waste management (Chen et al., 2020). For example, a study by Ekanem et al. (2013) found that environmental education programs in schools were effective in improving students' attitudes toward waste reduction and recycling.

People's beliefs and attitudes towards waste and the environment are closely interconnected, and they play an important role in shaping their waste management

behaviors. Hence, it is crucial to promote pro-environmental beliefs and attitudes through education and awareness-raising initiatives to encourage sustainable waste management practices.

Solid Waste Management Practices

Key elements of solid waste management include generation, storage, collection, transfer, and transport of waste, recycling and recovery, treatment, and final disposal. This ensures that when waste is produced at the primary level, it is either stored in dustbins or skips. It is then collected and transported to the final disposal site. On the other side, the waste collected can be recycled and reused for other products. These are further discussed below.

Stages of Solid Waste Management

Generation. This stage refers to the production of waste by human activities, such as consumption, industrial processes, and construction. The amount of waste generated depends on several factors, such as population density, level of economic development, and consumer behavior. The generation stage is important to understand as it provides insight into the sources of waste and can inform efforts to reduce the amount of waste generated. Hoornweg and Bhada-Tata (2012) report that "2 billion tons of global municipal solid waste (MSW) is generated per year with high-income countries accounting for nearly half of it.

In 2012, the World Bank estimated that 3.9 billion urban residents generated 1.2 kg of municipal solid waste (MSW) per person per day, whereas, in 2002, 2.9 billion urban residents generated 0.64 Kg of MSW per person per day". This indicates that after a decade, the rate of production of waste is expected to double because of rapid urbanization, which is exacerbating the situation. Throughout Africa, it has been found that the waste defined is primarily industrial and is largely

organic/putrescible/biodegradable. The difference in generation rates and characteristics depends mostly on local economies, levels of industrial development, available waste management systems, and lifestyles of the country concerned (Ekanem et al., 2013). Bello et al. (2016) argue that due to poor solid waste management in most African cities, cases of illegal dumping of waste in water bodies will increase, and isolated sites will further increase the already low sanitation coverage in most African countries. In low-income countries, organic waste accounts for a higher percentage of MSW, 50 to 70 percent of all MSW, compared to high-income countries where organic waste accounts for 20 to 40 percent.

However, most of the organic waste is dumped in landfills in low-income countries. Once organic matter is deposited in landfills, it lacks the oxygen it requires to decompose rapidly and instead produces toxic methane gas, which has a 21-fold greater effect on global warming. A 10-15% reduction in global greenhouse gas emissions could be achieved by diverting biodegradables from landfill sites (Ekanem et al., 2013). This is one of the waste sources that needs special consideration because it is non-biodegradable and takes about 500 years to break down.

Globally, it is estimated that waste from plastic produced annually is 260 million tons but only 9% is recycled (Ekanem et al., 2013). Projections of 15-20 million people are working in the informal waste recycling industry (Yoder, 2011). The program also reports that the WHO estimation of health-care waste per person per year in most low-income countries varies from 0.5 kg to 3 kg. Notwithstanding this, the causes of this rise would have been established by the organization responsible and thus the topic under consideration has not been exhausted. It is accepted that the generation of solid waste is growing at a faster rate globally, as

suggested by UNEP, as stated by Mensah and Larbi (2005) concerning the generation of solid waste in Ghana.

Separation. This stage involves separating waste into different categories, such as organic waste, recyclable materials, and hazardous waste. This helps to improve the efficiency and effectiveness of subsequent waste management processes. For example, separating recyclable materials makes it easier to recover valuable resources, while separating hazardous waste helps to ensure its safe disposal (Fadhullah, Imran, Ismail, Jaafar, and Abdullah, 2022). Solid waste segregation or separation remains a custom that is practically non-existent in most African countries. It is due to the economic limitations that govern most countries. For example, in South Africa, research in one of the major hospitals whose name has been withheld has shown that segregation of waste has not been practiced as a mixture of non-hazardous and hazardous waste (Kubanza and Simatele, 2020) is the same as other municipal solid waste. According to Gilbert, Ziqiang, and Hongzhi (2021), the transfer and transport of waste require two steps: (1) the transfer of waste from a smaller collection vehicle to a larger transport facility and (2) the subsequent transport of waste, typically over long distances to the final disposal site.

The collection involves the systematic collection of separated waste from homes, businesses, and public places. Collection systems can vary, including door-to-door collection, community drop-off centers, and curbside collection. The effective collection is crucial for the success of waste management programs, as it ensures that waste is collected in a timely and reliable manner and transported to processing or disposal facilities (Iraguha, Ramelan, and Setyono, 2022).

In some locations, individual bins/ containers are placed alongside the business centers, which were directly emptied into the trucks/ tippers. This prevents

residents from illegally dumping waste all over. On the other hand, the construction of these concrete bins and containers may be costly in most low-income countries, such as Zimbabwe. The collection of solid waste is a major problem for most local authorities, especially in Zimbabwe. The method of collecting solid waste is insufficient and presents a higher risk to society of having a health effect. World Bank (2021) says, "At least 2 billion people do not have access to routine collection of waste. Approximately 30 to 60 percent of all urban solid waste in developing countries is uncollected and less than 50 percent of the population is covered, and the collection in Africa varies from 25 percent to 70 percent. “In developing countries, waste collection costs are very high and account for 80 to 90 percent of the SWM budget, but collection rates are as low as 25 percent % (United Nations Environmental Program, 2019).

Uncollected waste is the main cause of blocked drainage and induces flooding and the eventual spread of waterborne diseases. Zimbabwean local authorities still face challenges in the processing and disposal of waste as required by the International Standards for the Collection of Residential Waste at least once a week (Chanza, Tevera, et al., 2017; World Bank, 2021). Alternatively, the collection has now been limited to fortnightly and monthly in most places. Most households lack receptacles to store waste at generation points, and some with receptacles are very small to hold waste for more than a day, thus increasing illegal dumping in open spaces.

Transfer. The transfer involves the movement of waste from collection vehicles to a transfer station, where it is temporarily stored before being transported to a processing or disposal facility (European Commission, 2020). Transfer stations provide a convenient location for waste consolidation and help to reduce the number

of trips required to transport waste to processing or disposal facilities. African countries can explore and pursue favorable regulatory and policy frameworks to enhance and strengthen institutional investments and efficient governance (African Union Development Agency, 2021). African union encourages African cities to recycle at least 50% of the waste material by 2023 (African Union Development Agency, 2021).

Transportation. Transportation involves the movement of waste from transfer stations to processing or disposal facilities. Waste transportation can have significant environmental impacts, such as air and noise pollution, and traffic congestion. Therefore, it is important to minimize the distance waste needs to be transported, and to use low-impact, fuel-efficient vehicles.

Recovery and recycling. Recovery and recycling involve the extraction of valuable materials from waste and their reuse in the production of new products. This helps to conserve natural resources and reduce the volume of waste going to landfills. Recycling can take place through a range of processes, including mechanical, chemical, and biological methods, and can result in the production of a range of products, including paper, plastics, metals, and chemicals.

Treatment. Treatment involves the processing of waste to make it safer and easier to manage, such as using composting, incineration, or landfilling. Treatment methods vary depending on the type of waste and the desired outcome but typically aim to reduce the volume and/or toxicity of waste. For example, composting can be used to break down organic waste into compost, while incineration can be used to convert waste into ash.

Final disposal. Final disposal refers to the safe and permanent disposal of waste, typically in a landfill. Landfilling is the most common method of final

disposal, although alternative methods, such as deep-well injection and ocean dumping, are also used in some countries. Effective final disposal is crucial to ensure that waste does not pose a threat to public health or the environment.

Historical Evolution of Enabling Environment Factors in Solid Waste Management

The historical evolution of enabling environment factors in solid waste management has been shaped by various socio-cultural, financial, institutional, and policy factors. These factors have played a significant role in determining the success and sustainability of solid waste management practices over time. In the early days, solid waste management was considered a minor concern and was primarily handled by individuals or communities through simple disposal methods such as open dumping or burning. However, as urbanization and industrialization increased, the volume and complexity of waste generated also increased, leading to environmental and health concerns. This led to the introduction of regulations, policies, and institutional arrangements that aimed to improve the management of solid waste.

In the 1980s and 1990s, the focus shifted towards integrated solid waste management approaches that aimed to reduce the environmental impact of waste, improve public health, and promote sustainable development. This was supported by the introduction of policies that emphasized the need for waste reduction, reuse, and recycling, as well as the adoption of modern waste management technologies.

In recent years, the importance of enabling environment factors has gained recognition in solid waste management. For example, financial support and incentives are crucial in promoting investment in waste management infrastructure and technology. Socio-cultural factors, such as public attitudes towards waste and recycling, also play a significant role in determining the success of waste management

practices. Institutions and policies also play a vital role in establishing the legal framework and regulations that guide solid waste management practices.

Overview of Current Trends and Best Practices in Solid Waste Management

In recent years, there has been a growing concern about the negative impacts of solid waste on the environment, public health, and sustainability (Iraguha et al., 2022). As a result, solid waste management practices have been continuously evolving, and new trends and best practices have emerged. Current trends and best practices in solid waste management which have been proven to be sustainable are:

Zero Waste: Zero waste is a concept that aims to minimize the amount of waste generated and maximize resource efficiency. This is achieved by reducing the amount of waste generated, increasing the recycling rate, and reusing materials as much as possible. In practice, this involves reducing, reusing, and recycling, and ultimately, eliminating waste.

Circular Economy: The circular economy is a model that aims to keep resources in use for as long as possible. This is achieved by designing out waste and pollution, keeping products and materials in use, and regenerating natural systems. This concept is being applied to solid waste management by promoting the reuse of materials, reducing the amount of waste generated, and maximizing resource efficiency.

Eco-friendly Waste Management Technologies: There has been a growing trend towards using eco-friendly waste management technologies, such as composting, bioreactor landfills, and recycling. These technologies aim to reduce the negative impacts of waste on the environment, public health, and sustainability.

Public-Private Partnerships: Public-private partnerships are becoming increasingly popular in solid waste management. In these partnerships, the public and private sectors work together to provide waste management services. This allows for the sharing of resources, expertise, and technology, and can lead to more efficient and effective solid waste management practices.

Community Involvement: Community involvement is increasingly being recognized as an important aspect of solid waste management. By engaging communities in waste management activities, they can be empowered to take responsibility for their waste and be motivated to reduce their waste footprint.

Waste-to-Energy: Waste-to-energy is a process that converts waste into energy. This is achieved by burning waste to generate heat and electricity. This technology has become increasingly popular as it provides a solution to the problem of waste disposal, while also generating energy (African Union Development Agency, 2021).

Recycling: Recycling remains one of the most important solid waste management practices. By recycling materials, resources are conserved, and the amount of waste that goes to landfill is reduced. There has been a growing trend towards single-stream recycling, where all recyclable materials are placed in the same bin, making it easier for people to recycle.

In conclusion, current trends, and best practices in solid waste management aim to minimize the negative impacts of waste on the environment, public health, and sustainability. These trends and best practices include zero waste, the circular economy, eco-friendly waste management technologies, public-private partnerships, community involvement, waste-to-energy, and recycling.

Summary of the Key Findings and Conclusions

From the review of the literature on solid waste management, it can be concluded that the proper management of solid waste is crucial for both environmental and public health reasons. It involves a series of steps, including waste generation, separation, collection, transportation, treatment, recovery and recycling, and final disposal.

Stakeholder involvement is critical in the solid waste management process and can include waste generators, regulators, municipalities, and service providers. Each of these stakeholders plays a specific role and has benefits and challenges associated with their involvement. An enabling environment that includes factors such as financial resources, socio-cultural attitudes, institutions, and policy, also plays a significant role in the success of solid waste management.

However, despite the importance of solid waste management, several challenges persist in the implementation of effective solid waste management programs. These include inadequate funding, limited public awareness and participation, and a lack of proper infrastructure and technology.

In conclusion, the proper management of solid waste requires a holistic approach that involves all relevant stakeholders and considers the enabling environment. Further research is needed to identify effective strategies to address the challenges in solid waste management and to improve the overall management of solid waste.

Gaps in the Existing Literature and Their Implications for This Study

The existing literature on solid waste management has been extensive and comprehensive, covering various aspects of the field, including waste generation and

separation, collection and transportation, recovery and recycling, treatment, final disposal, stakeholder involvement, and enabling environment factors. However, despite the wealth of information available, there are still some gaps in the existing literature that need to be addressed.

One of the gaps in the literature is the lack of a comprehensive and integrated approach to solid waste management. Many studies have focused on one specific aspect of solid waste management, such as collection and transportation, recovery and recycling, or stakeholder involvement, but there is a need for a more holistic and integrated approach that considers the interconnections and interdependencies between different aspects of solid waste management.

Another gap in the literature is the lack of attention to the context-specific nature of solid waste management. Many studies have adopted a one-size-fits-all approach, failing to consider the unique challenges and opportunities posed by different cultural, social, economic, and political contexts.

Furthermore, there is a need for more empirical studies and case studies to provide a better understanding of the realities of solid waste management practices in different parts of the world. Such studies can provide valuable insights into the successes and failures of solid waste management programs and inform the development of effective and sustainable strategies.

Additionally, there is a need for more attention to the development and implementation of innovative technologies and practices in solid waste management. With rapid technological advancements, there is an opportunity to develop new and more efficient ways of managing solid waste that can have a positive impact on the environment and human health.

In conclusion, the gaps in the existing literature on solid waste management highlight the need for a more comprehensive, integrated, and context-specific approach to the field. Further research is needed to fill these gaps and provide a better understanding of the challenges and opportunities posed by solid waste management, with a focus on the development and implementation of innovative technologies and practices.

Overview of How This Literature Contributes to The Thesis

The literature review helps to identify key factors that are important for effective solid waste management. It also highlights the importance of stakeholder involvement, community participation, and proper infrastructure for waste collection, transportation, and disposal. Overall, the literature review provides a strong foundation for understanding the challenges and opportunities in the field of solid waste management.

The literature review plays an important role in achieving the overall objective of the thesis by providing a deep understanding of the current state of solid waste management practices, the challenges faced, and the best practices for improving solid waste management. The review emphasizes the significance of engaging diverse stakeholders in solid waste management, including waste generators, regulators, municipalities, and service providers, to ensure a comprehensive and integrated approach to the problem.

The literature also highlights the critical role of enabling environment factors, such as financial, socio-cultural, institutional, and policy factors, in improving solid waste management practices. This information can be used to inform policy and decision-making processes, improve the financial and institutional systems that

support solid waste management, and foster greater community involvement and education.

Overall, the literature review provides a comprehensive and evidence-based foundation for the thesis and helps to further the goal of achieving good solid waste management practices. By drawing on the insights and findings from the literature, the thesis can provide practical recommendations and solutions for improving solid waste management practices.

CHAPTER 3

RESEARCH METHODOLOGY

Research Design

This study adopted a descriptive cross-sectional research design exploring factors affecting solid waste management practices. Thomas (2022) notes that a descriptive cross-section design explains and interprets the phenomenon under analysis or the relationship among a phenomenon at a fixed point in time, a snapshot. Variables are monitored without influencing them. Also, Cherry (2022), postulates that descriptive surveys are concerned with the circumstances or relationships that occur or exist, the processes that are taking place, and the apparent results or the patterns that are emerging. Researchers record the information that is present in the population, but they do not manipulate variables. The study utilized quantitative methodology through questionnaires.

Population and Sampling Procedures

A population is defined as an entire group that you want to conclude for example people, animals, plants, objects, or institutions from which research data may be collected (Bhandari, 2020). The total human population of Plumtree Town is 11600 according to the 2012 census (ZIMSTAT, 2019). To get the number of households, 3% of the population increase per year, multiplied by the number of years then divided by 6(average family size) that is:

$$Number\ of\ HH = \frac{\text{(Population Increase Rate x Population) x Number of Years)}}{\text{6 x 100}}$$

$$Number\ of\ HH = \frac{0.03\ x\ 11600\ x\ 9}{6\ x\ 100}$$

$$Number\ of\ HH = 2456$$

The sample for this study was determined using Sloven's Formula 1960.

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{2456}{(1 + 2456(0.05^2)}$$

$$n = 403$$

Where:

$$n\ is\ sample\ size$$

$$N\ is\ total\ population$$

$$e\ is\ rate\ of\ precision$$

Sampling Procedure

The study employed a stratified random sampling technique. A sample is a specific group that you will collect data from (Bhandari, 2020). Plumtree Town comprises residential areas with high, medium, and low-density suburbs, and the Director of Housing and Community Service and his team randomly provided the researcher with the number of households to be interviewed per suburb as shown below in Table 1.

Table 1. Households in Plumtree Town from the Housing Department

	Suburbs in Plumtree Town	No. of households in the catchment area
Households	High Density	190
	Medium Density	130
	Low Density	83
TOTAL		403

Data Collection Instrument

Data was obtained through questionnaires, and self-administered. The questionnaire consisted of two different parts. The first section included detailed information on demographics such as gender, age, level of education, residential area, and types of waste generated by households. The second part was based on the research questions of the study on the Likert scale with a maximum score of 5 (strongly agree) and 1 (strongly disagree). Responses were graded as shown below in Table 2.

Table 2: Likert Scale

Value	Mean Interval	Responses	Verbal Interpretation
1	1.00 – 1.49	Strongly Disagree	Very Low
2	1.50 – 2.49	Disagree	Low
3	2.50 – 3.49	Neutral	Average
4	3.50 – 4.49	Agree	High
5	4.50 – 5.00	Strongly Disagree	Very High

The questionnaire was assessed in a pilot study to check reliability, suitability, relevance, and accuracy. The exercise took place in Gwanda Town, Zimbabwe which is also situated in the province of Matabeleland South. This allowed the researcher to modify questions, including vocabulary, terminology, and clarification, where appropriate. 35 respondents were chosen randomly for a pilot study and were not part of the survey (Saunders, 2012). For reliability, Cronbach's alpha should be above 0.70 (70%) (Saunders, 2012)

Table 3. Reliability Statistics

Cronbach's Alpha	No. of Items
0.945	35

The Cronbach's Alpha was 94.5% which is higher than 70%, this means the instrument is reliable. The researcher ensured that the questions were valid and reliable by:

1. Avoiding entering two or more questions in one
2. Avoiding leading questions that may influence the respondents
3. Avoiding emotional language using direct language
4. Avoiding questions that have nothing to do with the research.

Data Collection Procedure

The data collection process for this study involved administering questionnaires to residents from the high, medium, and low-density suburbs in Plumtree Town, Zimbabwe. The first step, the researcher took was to seek permission from a controlling authority in Plumtree Town, Zimbabwe, to conduct the research. This was important to ensure that the research adheres to the regulations and guidelines of the jurisdiction where the study was to be conducted. Obtaining permission involved submitting a research proposal and getting approvals from the Director of the Housing and Community Services Department to conduct research within the town's jurisdiction. Once permission was granted, the next step was to obtain informed consent from the study participants, and since data was collected electronically through Google document, respondents were to read and if they agree to complete the questionnaire, were to agree to the term and conditions, which was the consent form.

To ensure quality data collection, data collectors received comprehensive training on the questionnaire administration process, online and practiced showing competency in filling in the online document. The training covered various aspects of data collection, including how to approach participants, how to ask questions, and

how to record responses accurately, assisting those without gadgets who do not know how to fill in the online document. During the data collection process, the researcher systematically monitored the administration of questionnaires by the data collectors to ensure consistency and adherence to the protocol as per the training. The researcher managed to provide data for two data collectors to assist those without data. Some residents managed to respond to the questionnaire when they visited the local authority to pay rates, the data collected would share the link and explain to them the procedure.

Moreover, to ensure the completeness and consistency of the data collected, the principal researcher reviewed the responses online daily during the data collection period. The review process involved checking for any missing responses or inconsistencies in the data collected. Any issues identified were immediately addressed by the researcher in consultation with the data collectors.

Method of Data Analysis

After the data was collected and consolidated in excel automatically, the researcher checked for completeness and then imported it into Statistical Package for Social Scientists (SPSS) version 22 for analysis. The data analysis process was iterative, allowing us to refine the analysis as the researcher reviewed the data.

For the first section of the instrument (Section A), the researcher generated means and frequencies to provide an overview of the data. This helped in identifying patterns and trends in the data and understanding the distribution of responses across different variables.

For the second section of the instrument (Section B), means, standard deviation and correlation analysis were used in determining the relationship between variables. Specifically, the researcher examined the relationship between the

independent variable (X) and the dependent variable (Y) using Pearson's correlation coefficient. This allowed the researcher to quantify the strength and direction of the relationship between the variables and determine whether they were positively or negatively correlated.

By examining the relationship between the variables, the researcher was able to gain insights into how changes in one variable (the independent variable) impacted the other (the dependent variable). This information was important in understanding the nature of the relationship between the variables and how they might be related in a real-world context.

In conclusion, the method of data analysis involved generating means and frequencies for Section A and using means, standard deviation, and correlation analysis to determine the relationship between variables in Section B. Specifically, Pearson's correlation coefficient was used to identify the strength and direction of the relationship between the independent and dependent variables.

Research Ethical Consideration

The researcher reported to and informed the local authority, the Director of Housing and Community Services of Plumtree Town Council. Confidentiality of information and anonymity of data recording was ensured. The researcher safeguarded that the participants will not be exposed to circumstances where they may be subject to physical or psychological harm. Confidentiality was retained as the names and addresses of the participants will not be documented on the questionnaires (Strech, Mertz, Knüppel, Neitzke, and Schmidhuber, 2013). Participants were briefed on the scope of the research before the start of data collection and were to agree on the google document to consent if they intend to participate.

CHAPTER 4

RESULTS AND DISCUSSIONS

The main purpose of this chapter is to present the research findings and the associated discussion of the interpretation. The research findings and discussion, therefore, are done under the cover of the key concept that underlies each of the research questions contained in the questionnaire used for this research study.

Study Setting

The research was conducted in residential suburbs of Plumtree Town, Zimbabwe, high, medium, and low-density suburbs. The population for the Town as of the 2012 census (Zimbabwe National Statistics Agency, 2016) was 11600, 3% of the population increase per year was factored for nine years giving us a population of 14 732 with 2456 households.

Response Rate

The response rate is a significant indicator of the quality study. The response rate was calculated by dividing the total number of respondents by the sample size. It is critical to acquire a good research response rate to guarantee the results are representative of the desired population and that the questionnaire is performed effectively. A questionnaire in a form of a google document was generated to reduce human contact during the COVID-19 pandemic, from October to December 2021, and two data collectors were trained to collect accurate data. 403 respondents managed to respond online within the 3 months out of a total of 2 456 households in Plumtree Town. Table 4 shows the response rate of the study.

Table 4. Response Rate of the Study

Total # of respondents	Sample Size	Response Rate (%)
403	403	100%

As presented in Table 4 above, the calculated sample size was 403 and the questionnaire google docs link was sent to people responsible such as council workers, and ward councilors, to share with residents in Plumtree Town through the WhatsApp platforms and emails. The two data collectors assisted those without data and did not know how to fill in an online document. A period of 3 months was set to collect data from Plumtree Town residence, and 403 residents responded to the google docs questionnaire, reaching a 100% response rate, and is a representation of Plumtree Town, Zimbabwe.

Research Question 1: Relationship of Gender, Age, Level of Education, and Residential Area to Solid Waste Management Practices in Plumtree Town, Zimbabwe

It appears that both men and women in the study had a similar level of appreciation for solid waste management, as indicated by the average as evidenced by a mean of 3.3762 (SD .52064). The data suggests that there is no significant difference in solid waste management practices between males and females in Plumtree Town, Zimbabwe. Both genders have shown an average appreciation for solid waste management practices. This is supported by the mean scores for both male (M=3.3936, SD=.47377) and female (M=3.3647, SD=.55027) respondents not being significantly different from the overall mean score (M=3.3762, SD=.52064).

Table 5. Gender and Solid Waste Management

Gender	Mean	N	Std. Deviation
Male	3.3936	161	.47377
Female	3.3647	242	.55027
Total	3.3762	403	.52064

Previous studies have also indicated similar findings regarding gender and solid waste management practices. For example, a study by Obeng-Odoom, Danso-Abbeam, & Abavare (2019) in Ghana found that gender was not a significant predictor of household waste segregation behavior. Another study by Akindele and Yusuf (2020) in Nigeria reported that there was no statistically significant difference in waste disposal behaviors between males and females.

Overall, these findings suggest that gender may not be a significant factor in predicting solid waste management practices. Instead, other factors such as education, income, and environmental awareness may play a more important role in shaping individual attitudes and behaviors toward solid waste management.

Table 6.: Age of Respondents

Category	Frequency	Percent
Below 21 years	21	5.2
21-30 years	96	23.8
31-40 years	145	36
41-50 years	77	19.1
Above 50 years	64	15.9
Total	403	100

According to Table 6, the age of the study participants is distributed in such a way that most of the respondents are within the age bracket of 31 to 40 (36%). This is the age when most people get married or become independent hence having the highest number of respondents in this range. This is followed by the age bracket of 21

to 30 years (23.8%). In addition, Plumtree Town is dominated by a middle age population as evidenced by the data above. This means that the probability of knowing how to manage solid waste is high.

Age is another factor that can influence solid waste management practices, as younger and older individuals may have different attitudes and behaviors regarding waste disposal and recycling as evidenced by the above results. According to a study by Jensen, Prendeville, Bocken, and Peck (2019), younger generations are generally more environmentally conscious and willing to adopt sustainable waste management practices, such as waste segregation and recycling. However, the study also found that younger individuals may lack knowledge and awareness about waste management and may need targeted education and awareness campaigns to promote sustainable waste management practices.

On the other hand, older individuals may have more experience and knowledge about waste management but may be less willing to change their behaviors or adopt new practices. A study by Pahl, Sheppard, Boomsma, and Groves (2014)found that older adults in the UK were less likely to engage in pro-environmental behaviors, such as recycling, due to a perceived lack of personal relevance and benefit. In summary, age can influence solid waste management practices, and targeted education and awareness campaigns may be necessary to promote sustainable waste management practices across different age groups.

Table 7. Level of Education

Education	Mean	N	Std. Deviation
Primary	3.6429	4	.40979
O Level	3.2153	4	.51591
A Level	3.1227	4	.43606
Vocational Training/ Certificate	3.5089	2	.42983
Diploma	3.4698	1	.46672
University Graduate	3.4071	48	.57071
Total	3.3762	03	.52064

There was an average appreciation by all respondents irrespective of their level of education as evidenced by a mean of 3.3762 (SD .52064). There may not be a significant difference in the level of solid waste management practices among individuals with different levels of education. However, it is important to note that the data presented in the table only provides a limited snapshot of the relationship between education and solid waste management practices. Several studies have found that education can play a significant role in promoting responsible solid waste management practices.

For example, a study conducted in Iran by Farzadkia, Javid, Yazdanpanah, Dehghani, and Hassanvand (2019) found that higher education levels were associated with better knowledge and practices related to household waste management. Similarly, a study by Shahabuddin and Rahman (2017) in Bangladesh found that education was positively associated with household waste management practices such as waste separation and composting.

Despite these findings, some studies have found no significant relationship between education levels and solid waste management practices. For instance, a study conducted in Nigeria by Ezeah, Roberts, and Byrne (2013) found that education had no significant influence on household waste management practices. Education has been shown to play a positive role in promoting responsible solid waste management

practices in some studies, the relationship may not be consistent across all contexts. Further research is needed to explore the complex relationships between education, socio-economic factors, cultural norms, and solid waste management practices.

Table 8. Residential Area

Suburb	Mean	N	Std. Deviation
Low-Density Area	3.6448	82	.49084
Medium Density Area	3.5748	132	.50282
High-Density Area	3.1210	189	.41835
Total	3.3762	403	.52064

With regards to suburb and solid waste management practices in Plumtree Town, there was an average appreciation (3.3762). The highest mean was for the residency in the low-density suburbs (3.36448) and the lowest mean was for the high-density suburbs (3.121). Based on the data provided, it appears that there is a negative relationship between suburb and solid waste management practices in Plumtree Town, Zimbabwe. The data suggests that as the density of the area increases, the mean score decreases, indicating poorer solid waste management practices. This relationship is supported by current literature. For example, a study conducted by Muzenda, Manyuchi, Mbohwa, and Muzenda-Mudavanhu (2018) found that densely populated urban areas in Zimbabwe are more likely to have issues with solid waste management, including inadequate collection systems and illegal dumping. Similarly, a study by Chinyama and Chipangura (2020) found that population density was a significant predictor of poor waste management practices in Zimbabwean cities.

Therefore, policymakers and local authorities in Plumtree Town need to recognize the impact of suburb density on solid waste management practices and

prioritize targeted interventions in high-density areas to improve the overall cleanliness and health of the town.

Research Question 2: Management of Solid Waste in Plumtree Town, Zimbabwe

All respondents generate food debris, making 100%. This is organic waste mostly coming from the kitchen for example, vegetable peels, food leftovers, rotten food stuff, etc. this type of waste is degradable and decomposes and it is best used as natural fertilizers. While plastics are generated by 99.8% of the respondents. This type of waste consists of bags, plastic bottles, and many more that are commonly found anywhere. This waste causes a nuisance in the environment if not managed well. Most of this waste is recyclable or reusable waste. 93.8% of the respondents, discard glass bottles and cans. This type of waste is mostly recycled into by- products. Yard trimmings, 73.4%, and biomedical waste contribute to 29.5% of the waste generated.

Table 9. Type of Waste Generated by Household

Waste Generated	Frequency	Percent
Food debris	403	100
Plastic	402	99.8
Grass bottles and cans	378	93.8
Yard trimmings	296	73.4
Biomedical waste e.g., sanitary pads	119	29.5

All these types of waste generated by Plumtree residence are either composted, reusable, or recyclable waste which finds its way to the dumpsite and illegally dumped by the roadside. Recycling waste assists in reducing the environmental effects of improper waste disposal, creating revenue, solid waste management systems costs are reduced greatly, and saving energy and natural resources.

The United States government and non-government agencies have recognized the importance of recycling waste, but there is a lack of standardized guidelines for safe recycling practices. Studies have shown that only 7% to 15% of waste is being recycled in the United States. However, if recycling is done properly, it can help to address waste management issues. At the community level, many NGOs and private sector enterprises have taken the initiative to segregate and recycle waste.

EXNORA International in Chennai has implemented effective waste management practices, such as recycling and composting, to manage the waste collected. Plastics are also sold to factories for reuse, according to the United Nations Environmental Program, (2000). However, the lack of education and awareness of proper waste management practices is still a major challenge at the household level. A study conducted in Gaborone, Botswana, revealed that although citizens were aware of sustainable waste management techniques like recycling, this awareness did not always lead to participation in pro-environmental activities like recycling initiatives, (Bolaane, 2006).

Table 10. Descriptive Statistics

	N	Mean	Std. Deviation
I do compost at my house as a way of processing biodegradable waste	403	3.9975	0.94237
Hazardous waste is separated and handled with great care at the generation level	403	3.66	0.78612
Landfilling of waste is done after separation	03	3.5012	0.77065
Non- biodegradable waste like plastic, metal parts, fiber, etc.	03	3.5658	0.77107
There is regular transportation of solid waste	03	3.0521	0.94356
There are appropriate disposal sites for solid waste	03	3.3896	0.90306
There is the separation of waste at the source	03	3.2407	0.94323
There are two bins at each location/home/organization one for biodegradable and the other for recyclable waste	03	2.603	1.08412
Solid Waste Management Average	**03**	**3.3762**	**0.52064**

The lowest mean (2.60) was on the question, 'there are two bins at each location/home/organization one for biodegradable and the other for recyclable waste.' On this question, the level of waste management is average hence the mean of 2.6. This also shows that the local authority is not providing receptacle color-coded bins for waste management.

On the other hand, the highest mean was on the question 'I do compost at my house as a way of processing biodegradable waste.' On this question, the level of waste management is high as evidenced by the mean of 3.99. This reflects that most residents have the knowledge and agree on composting, which plays a significant role in reducing the amount of waste in a landfill.

Overall, solid waste is averagely managed in Plumtree Town, Zimbabwe as evidenced by the mean of 3.37. Plumtree Town Council is trying its best in managing waste as compared to other cities in Zimbabwe as residents in other cities are ever complaining about poor solid waste management. Community involvement is increasingly being recognized as an important aspect of solid waste management. By engaging communities in waste management activities, they can be empowered to

take responsibility for their waste, and be motivated to reduce their waste footprint (Le et al., 2018). Raising environmental awareness and promoting sustainable consumption practices and waste management education are necessary to cultivate an individual's conscience towards environmental concerns, according to the African Union Development Agency (2021). The European Commission (2020) found that having knowledge about environmental conservation positively affects attitudes towards recycling, but a positive attitude alone may not translate into recycling behavior if there is a lack of understanding about how to recycle properly. Therefore, it is essential to provide education and knowledge about waste management and recycling to encourage individuals to take responsibility for their actions and promote environmental sustainability.

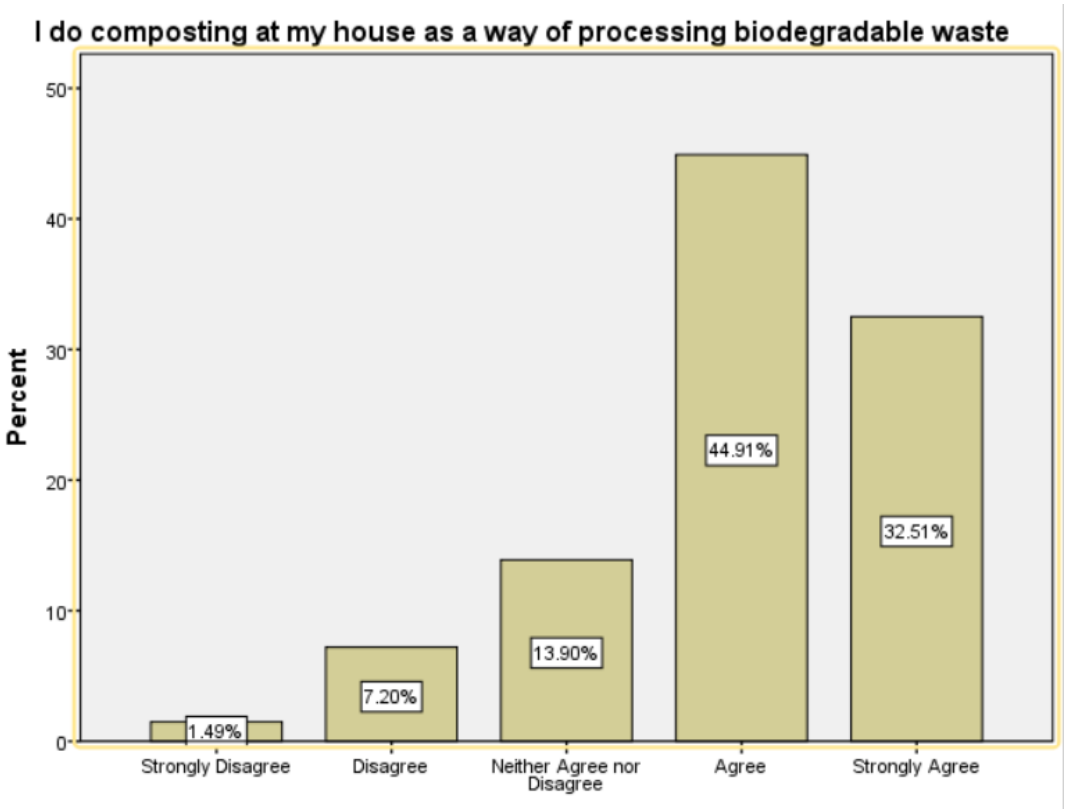

Figure 2. Composting at Source

Regarding the question on those composting at source, 77% of the total respondents agreed that they do composting in their homesteads as shown in Figure 2 above. On the question regarding the transportation of solid waste, 61% (Figure 3) of the respondents disagreed that there is regular transportation of solid waste. Plumtree Town Council could be facing challenges in transportation of the same due to fuel and transportation shortages. Some residents were asserting that the council uses a tractor towing a trailer in the transportation of solid waste. Considering the speed of the tractor and the size of the trailer, this hampers the efficiency in the collection of garbage.

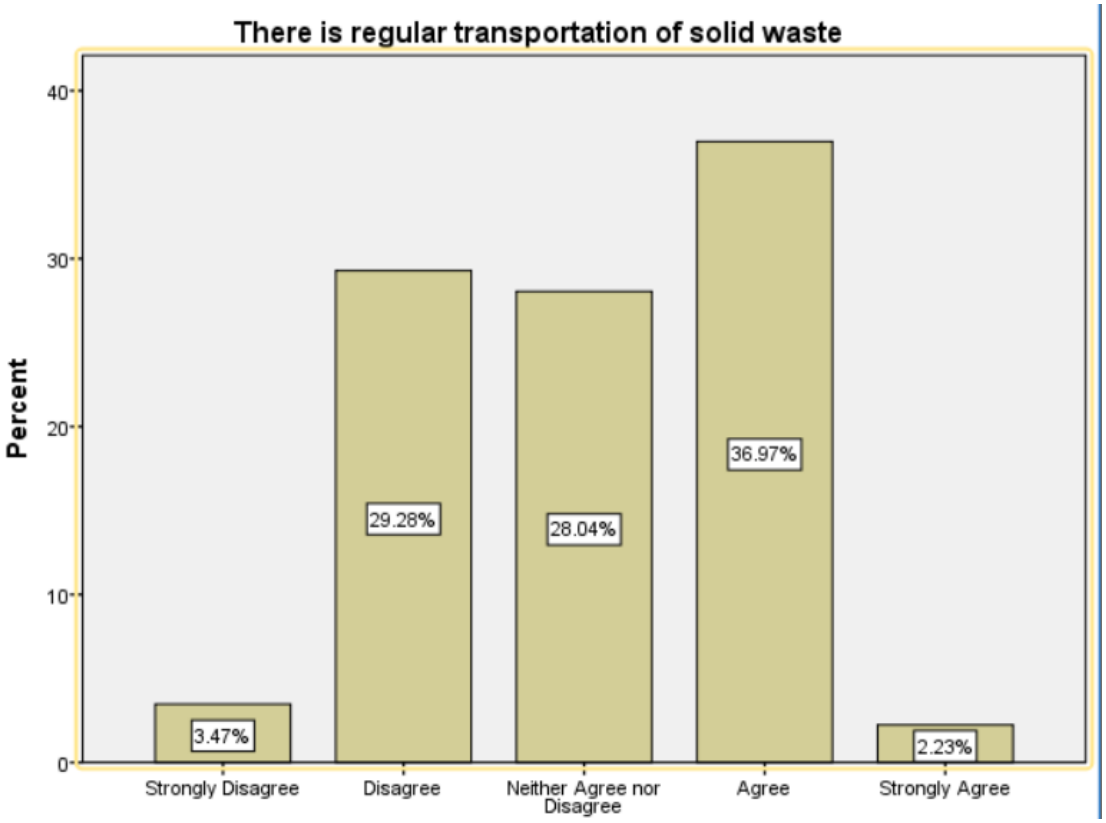

Figure 3. Solid Waste Transportation

On having two bins at each location for bio-degradable and recyclable waste (Figure 4), it appears that most homesteads (61%) disagree with having two bins.

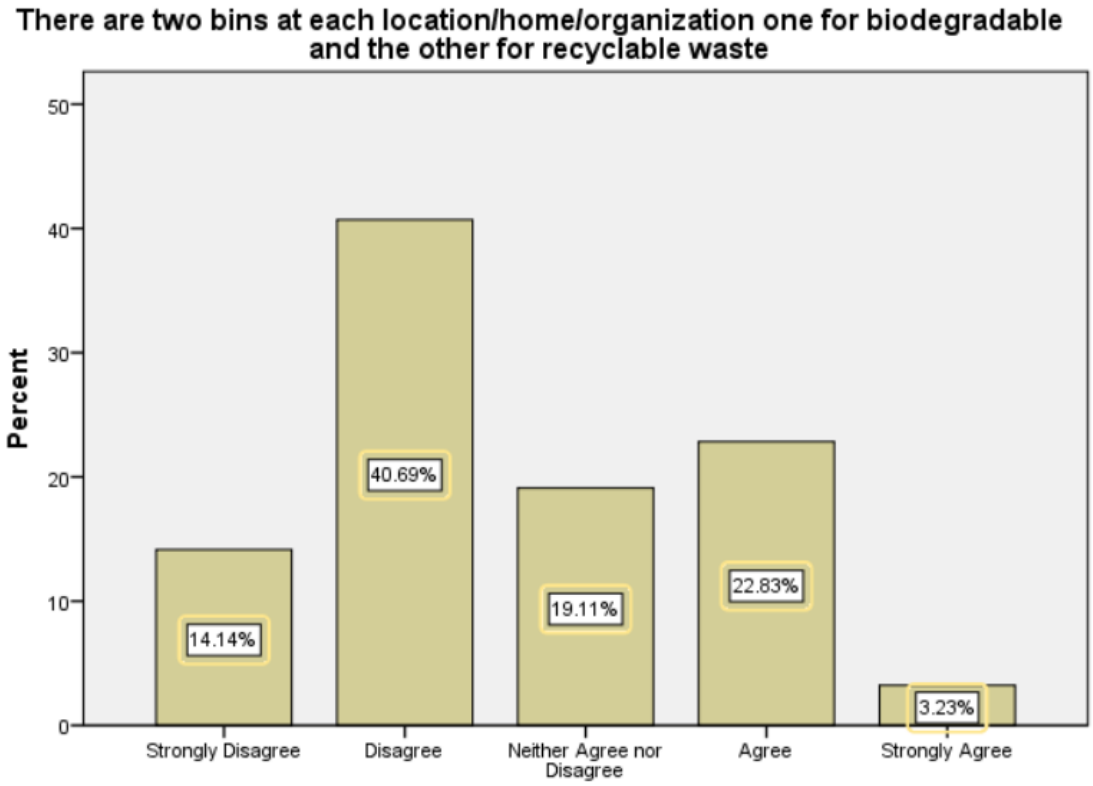

Figure 4. Two Bins per Location

Table 11. Frequencies

Question	SD	D	U	A	SA	Median
I do compost at my house as a way of processing biodegradable waste	6(2%)	29 (7%)	56(14%)	181(45%)	131 (33%)	4
Hazardous waste is separated and handled with great care at the generation level		35(9%)	111(28%)	213(53%)	44 (11%)	4
Landfilling of waste is done after separation	6(2%)	28(7%)	150 (37%)	196 (49%)	23 (6%)	4
Non- biodegradable waste like plastic, metal parts, fiber, etc.		34 (8%)	143 (36%)	190 (47%)	36 (9%)	4
There is regular transportation of solid waste	14 (4%)	118 (29%)	113 (28%)	149 (37%)	9 (2%)	4
There are appropriate disposal sites for solid waste	14 (4%)	61 (15%)	95 (24%)	220 (55%)	13 (3%)	4
There is the separation of waste at the source	6 (2%)	99 (25%)	115 (29%)	158 (39%)	25 (6%)	3
There are two bins at each location/home/organization one for biodegradable and the other for recyclable waste	57 (14%)	164 (41%)	77 (19%)	92 (23%)	13 (3%)	2

This table presents the results of a survey conducted in Plumtree Town, Zimbabwe to assess residents' perceptions of various solid waste management practices. To present the data, the researchers utilized a 5-point Likert scale that ranged from "strongly disagree" to "strongly agree." The data was reported in frequency form for each response category. The median value for each question is also provided. Overall, the responses suggest that residents in Plumtree Town generally have positive perceptions of solid waste management practices, with more than half of respondents indicating agreement or strong agreement for most questions. However, there is room for improvement in certain areas such as waste separation at source and availability of two bins for biodegradable and recyclable waste.

Research Question 3: Relationship of Stakeholders Involvement Factors, and Solid Waste Management Practices in Plumtree Town, Zimbabwe

Stakeholder involvement in management of solid waste refers to the active participation and contribution of different groups of people in the planning, implementation, and management of waste programs and events.

Table 12. Stakeholder Involvement

		SWMAve
SIAve	Pearson Correlation	.654**
	Sig. (2-tailed)	.000
	N	403

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

The relationship between stakeholder involvement factors and solid waste management practices was investigated using Pearson product-moment correlation

coefficient. There was a positive correlation between the two variables [r=.654, n=403, p>.000]. While it is true that stakeholder involvement can lead to increased solid waste management, it is important to note that responsibility for waste management should not solely rest on municipal authorities and stakeholders. Waste management is a shared responsibility that involves individuals, businesses, governments, and other organizations. Menon and Palackal's (2021) statement may reflect a common misconception that waste management is solely the responsibility of government agencies or private entities.

However, sustainable waste management requires a collaborative effort from all stakeholders to reduce waste generation, improve collection and disposal methods, and promote recycling and reuse. It is therefore important for stakeholders to be actively involved in waste management initiatives and for governments to provide the necessary support and resources to facilitate their participation. This can help to ensure that waste management practices are effective, efficient, and sustainable over the long term. Community members just play the role of waste generators, but through a decentralization approach, the municipality and the community can play a role in the management activities and there is ownership of the project. It is reported that, if a government or municipal bodies share responsibilities of solid waste management among the stakeholders, the efficiency of the management of solid waste management can be increased.

Table 13. Stakeholder Involvement Control Variable

Control Variables	SWMAve
Suburb SIAve Correlation	.582
Significance (2-tailed)	.000
Df	398

The relationship between stakeholder involvement factors and solid waste management practices was investigated using Pearson product-moment correlation coefficient after controlling for suburbs. There was a positive correlation between the two variables [r=.582, sig=.000, df=398]. This displays that as stakeholder involvement increases, solid waste management also increases, and the suburb type does not affect it.

Throughout human history, waste has been a constant presence in human settlements, and unfortunately, its disposal has often been approached with carelessness. Waste has been discarded in streets, bodies of water, the air, and even in our own backyards. There has also been a tendency to dump waste in areas where the least powerful segments of society live. Despite efforts by developed countries to address municipal solid waste crises with regulations, policies, and programs, the problem remains unsolved. Municipal solid waste management continues to be a complex issue globally due to a lack of social responsibility, the rapid pace of urbanization, unscientific development practices, and a general lack of concern.

When it comes to municipal solid waste management, it is not sufficient to rely solely on technological innovations or adoption of new technologies. Additionally, it is not the sole responsibility of the government to manage this issue. Instead, it is crucial to involve various stakeholders and coordinate efforts towards achieving sustainability. Therefore, the participation and collaboration of various stakeholders are necessary to address the complex issue of municipal solid waste management.

Recent research has shown that achieving efficient and sustainable solid waste management requires the involvement of all stakeholders in the process. Strategies such as empowerment, partnerships, dialogues, and consultations are essential in

improving waste separation at the source, storage techniques, waste collection, and transport services. Stakeholder engagement forums like surveys, citizen panels, stakeholder meetings, and workshops also help improve aspects of waste management processes like waste transport. Effective communication practices such as consultation, negotiations, compromises, and confrontations are also significant in improving the cost aspect of domestic waste management. At the local level, community involvement is vital to the success of waste management. However, structured stakeholder engagement is necessary to coordinate all efforts towards the common goal of improving domestic waste management and ensuring its sustainability.

Research Question 4: Impact of Enabling Environment Factors on Solid Waste Management Practices in Plumtree Town, Zimbabwe

The table presents the results of a correlation analysis between two variables: Solid Waste Management Practices Ave (SWMAve) and Enabling Environmental Ave (EEAve). The Pearson correlation coefficient obtained is .679**, which suggests a strong positive correlation between these variables. The p-value obtained is .000, indicating that the correlation is statistically significant at the 0.05 level. The sample size for this analysis is 403.

Table 14. Enabling Environmental Factors

	SWM Ave
EEAve Pearson Correlation	.679**
Sig. (2-tailed)	.000
N	403

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

These results suggest that there is a positive relationship between SWMAve and EEAve, meaning that as SWMAve increases, EEAve also tends to increase. This finding aligns with the notion that effective solid waste management practices are a key component of a sustainable and healthy environment. There is a wealth of literature on management of solid waste, including studies on reducing waste, recycling, and disposal methods. For instance, a study by Jribi, Ben-Ismail, Doggui, Debbabi, and Zairi (2021) explored the impact of the COVID-19 pandemic on management of waste and environmental sustainability. Another study by Gholampour, Khorramdel, and Lee (2021) examined the use of life cycle assessment in evaluating the environmental performance of different waste management options.

Table 15. Enabling Factors Control Variable

Control Variables	SWMAve
Suburb EEAve Correlation	.651
Significance (2-tailed)	.000
Df	400

The relationship between enabling factors and solid waste management practices was investigated using Pearson product-moment correlation coefficient after controlling for suburbs. The table above shows the correlation and significance (2-tailed) between the EEAve of the suburb and its overall performance in the financial/economics, socio-cultural, institutional, and policy factors. The correlation coefficient value of .651 suggests a strong positive relationship between the enabling environment factors and the suburb. The significant value of .000 indicates that this relationship is statistically significant at a high level of confidence.

Solid waste management is an important aspect of urban sustainability, and the enabling environment of a suburb can play a crucial part in determining the

effectiveness of managing solid waste. For instance, in a study by Kaza et al. (2018), it was found that the presence of supportive policies and institutional frameworks was positively associated with improved management of solid waste outcomes in cities. Similarly, a study by Salam, Iqbal, Rahman, Uddin, and Islam (2020) found that community participation and awareness, as well as institutional support, were important factors in ensuring effective management of solid waste in municipal areas.

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Solid waste management is an important aspect of urban sustainability, and the enabling environment of a suburb can play a crucial role in determining the effectiveness of solid waste management practices. For instance, in a study by Kaza et al. (2018), it was found that the presence of supportive policies and institutional frameworks was positively associated with improved solid waste management outcomes in cities. Similarly, a study by Salam et al. (2020) found that community participation and awareness, as well as institutional support, were important factors in ensuring effective management of solid waste in urban areas.

There are several best practices that Plumtree Town Council can adopt from developed countries to manage solid waste at the household level and motivate residents to practice proper waste management. Some of these practices are:

1. Recycling Programs: Developed nations have successfully implemented recycling programs that involve separating recyclable materials at the household level, resulting in more efficient waste management. This approach could be adopted in Plumtree Town as a means of encouraging residents to separate recyclable materials from non-recyclable waste right from the source.

2. Composting: To reduce the amount of organic waste that ends up in landfills, many developed nations have successfully implemented composting programs. Plumtree Town can take a cue from these countries by encouraging residents to compost organic waste, including food scraps and yard waste. Composting is an eco-friendly practice that converts organic waste into nutrient-rich fertilizer for gardens and crops, thus promoting sustainable waste management practices in the community.

3. Education and Awareness: Developed countries invest in educating their citizens about proper waste management practices, such as reducing waste, reusing items, and recycling. Plumtree Town Council can develop education and awareness programs to encourage management of waste in the community.

4. Incentives and Penalties: In developed countries, municipalities incentivize residents who practice proper waste management and penalize those who do not. Plumtree Town Council can consider adopting a similar approach to encourage residents to practice proper waste management.

5. Technology: Developed countries use technology, such as waste-to-energy plants, to manage waste effectively. Plumtree Town Council can explore the use of technology to manage waste and lessen the quantity of waste that is dumped in landfills.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

The major findings of the study are summarized in this chapter., conclusion, and recommendations regarding the assessment of residents' perception of factors affecting solid waste management practices in Plumtree Town, Zimbabwe.

Summary

To meet the objective of the study, the following research questions were addressed: answer these questions, three research questions were formulated in the study:

1. How do gender, age, level of education, and residential area relate to solid waste management practices in Plumtree Town, Zimbabwe?
2. How is solid waste being managed in Plumtree Town, Zimbabwe?
3. What is the relationship between stakeholder involvement factors, such as waste generators, regulators, service providers, and solid waste management practices in Plumtree Town, Zimbabwe?
4. What is the impact of enabling environment factors on solid waste management practices in Plumtree Town, Zimbabwe?

A descriptive cross-sectional research design was utilized in the study to assess residents' perception of factors affecting solid waste management practices in Plumtree Town, Zimbabwe. A structured questionnaire was the main data collection tool for the study and data was collected from 403 residents of Plumtree Town. The study revealed the following major findings:

The study found that there are gaps in solid waste management practices in Plumtree Town, including inadequate waste collection and disposal infrastructure,

poor waste segregation practices, and limited community awareness and participation in waste management.

Stakeholder involvement is positively correlated with solid waste management practices in Plumtree Town. Engaging stakeholders through empowerment, partnerships, dialogues, and consultations can improve waste separation, storage, collection, and transport services. The cost of solid waste management at the level of the household can be reduced using communication techniques such consultation, negotiation, compromise, and confrontation.

Enabling factors, such as adequate financial resources and infrastructure, positively affect solid waste management practices in Plumtree Town. Improved enabling factors can lead to improved waste disposal methods and a more environmentally friendly waste disposal system. Financial constraints and inadequate infrastructure were identified as major obstacles to effective management of solid waste in the town.

Conclusion

In conclusion, the assessment of the residents' perception of factors affecting solid waste management practices in Plumtree Town, Zimbabwe, has revealed several important findings. Firstly, it was found that there is a medium positive correlation between stakeholder involvement and solid waste management practices. This suggests that involving stakeholders in waste management processes can lead to improvements in solid waste management practices. Secondly, enabling factors were found to have a medium positive correlation with solid waste management practices, indicating that improvements in enabling factors can lead to better solid waste management practices. Lastly, financial constraints were identified as major obstacles to the management of solid waste in the country.

Based on these findings, several recommendations can be taken to improve solid waste management practices in Plumtree Town Council. These include increasing stakeholder involvement in waste management processes, improving enabling factors such as infrastructure and equipment, and addressing financial constraints. Additionally, compliance with relevant legislation and regulations related to waste management should be enforced to ensure that all persons and entities generating waste employ measures to reduce waste through treatment, reclamation, and recycling.

Overall, addressing these factors and implementing the recommended interventions can lead to more sustainable and efficient solid waste management practices in Plumtree Town Council, ultimately benefiting both the environment and the community.

Recommendations

Based on the findings of this research, the following are the recommendations for improving solid waste management in Plumtree Town, Zimbabwe:

1. Provide color-coded bins for waste management: As the research results indicate, there is a lack of color-coded bins for waste management in Plumtree Town. Local authorities should consider providing these bins to help residents segregate their waste into recyclable and biodegradable waste. This will help to improve the level of waste management in the area.
2. Encourage composting: The high mean score on the question about composting designates that many residents are already composting at the household level. Local authorities should encourage more people to compost their biodegradable waste by providing education on how to do it and promoting the benefits of composting.
3. Increase environmental awareness and education: It is essential to raise awareness and educate residents about environmental conservation and sustainable consumption practices. This will help to create a positive attitude towards waste reduction and recycling and empower individuals to take responsibility for their waste.

4. Involve stakeholders in the management of solid waste process: Stakeholder involvement is critical to addressing specific solid waste management challenges faced in a particular community or region. Waste generators, regulators, municipalities, and service providers all have valuable contributions to make. Local authorities should involve these stakeholders in the solid waste management process to create a more comprehensive and participatory approach.

5. Improve communication: To improve waste management practices in Plumtree Town Council, it is important for waste managers and community health clubs to ensure that the information they communicate to the public is aligned with the knowledge and understanding that residents already possess. This requires clear and concise communication that is easy for residents to understand, emphasizing the importance of waste reduction and recycling and outlining specific actions that individuals can take to contribute to these efforts.

6. Involve stakeholders in waste management planning: To develop a comprehensive and participatory approach to solid waste management, it is essential for local authorities to involve stakeholders in the planning process. This means considering the needs and concerns of all stakeholders to ensure that their perspectives are represented in the decision-making process. By doing so, local authorities can create a more inclusive and effective approach to solid waste management that is informed by the insights and experiences of those who are most affected by these issues.

7. Encourage community participation: Encouraging community members to actively participate in solid waste management activities such as waste reduction, segregation, and recycling can foster a sense of ownership and responsibility for the project, and ultimately enhance the efficiency of waste management.

8. Share responsibilities of solid waste management: To ensure a more effective and efficient waste management program, it is important for governments and municipal bodies to share responsibilities for solid waste management among all stakeholders. This will help to distribute the workload and resources and ensure that everyone involved has a sense of ownership and responsibility for the success of the program.

9. Increase awareness and education: To improve solid waste management practices, stakeholders should be educated about the significance of waste management and their role in the process. This approach will foster a positive attitude towards waste reduction and recycling, thereby encouraging active involvement in waste management activities. Removing plagiarism, please let me know if you need further assistance.

10. Provide resources and support: To ensure effective and efficient solid waste management, local authorities should provide stakeholders involved in waste management activities with the necessary resources and support. These resources could include technical expertise, equipment, and funding. This will help to ensure that waste management activities are carried out smoothly and in a sustainable manner.

11. Increase investment in enabling factors: Given that enabling factors play a critical role in solid waste management, it is suggested that greater investments should be made in enhancing these factors. This involves investing in the required infrastructure, vehicles, and workforce to effectively manage solid waste.

12. Enforce regulations: The Environmental Management Act and Public Health Act provide regulations for waste management practices. It is recommended that these regulations be strictly enforced to ensure compliance and hold those responsible for waste management accountable for their actions.

13. Improve workforce training and qualifications: Improving the training and qualifications of the workforce is crucial for effective solid waste management, as identified in the study. The current situation of an over-staffed and under-qualified workforce is a major obstacle to the management of solid waste. Therefore, it is recommended to invest in training programs to ensure that the workforce is equipped with the necessary skills and knowledge to manage solid waste efficiently. This will not only improve the quality of waste management but also lead to job satisfaction for the workforce, ultimately resulting in a better and more sustainable waste management system.

Future Research

After concluding the study and considering its limitations, it is recommended for future research to conduct a study with a larger sample size. This will enable the researchers to gather more diverse demographic information from residents and compare the results.

REFERENCES

Abba, A. H., Noor, Z. Z., Yusuf, R. O., Din, M. F. M. D., & Hassan, M. A. A. (2013). Assessing environmental impacts of municipal solid waste of Johor by analytical hierarchy process. *Resources, Conservation and Recycling*, *73*, 188–196.

Abimbola, O. A., Kolawole, A. A., & Olufunke, A. O. (2017). Impact of International Public Sector Accounting Standards (IPSAS) adoption on financial accountability in selected local governments of Oyo State, Nigeria. *Asian Journal of Economics, Business and Accounting*, *3*(2), 1–9.

Abubakari, A., Koranteng, S., & Asamoah, E. (2020). Solid waste management practices and challenges in developing countries: A review. *Journal of Environmental and Public Health*.

African Union Development Agency. (2021). The African Union Development Agency (AUDA-NEPAD) Chief Executive Officer Nardos Bekele-Thomas hosts AU Media Fellows. Retrieved from African Union Development Agency website: https://au.int/en/pressreleases/20221221/auda-nepad-chief-executive-officer-nardos-bekele-thomas-hosts-au-media

Ahmed, S., & Ali, M. (2021). Stakeholder participation in solid waste management and environmental implications: Evidence from Dhaka, Bangladesh. *Journal of Environmental Management*, *284*.

Akindele, S. T., & Yusuf, R. O. (2020). Gender and solid waste disposal behavior: Evidence from Ilorin, Nigeria. *Journal of Environmental Management*, *256*.

Alberti, C., Figueira, R., Hofmann, M., Koschke, S., & Enthaler, S. (2019). Chemical Recycling of End-of-Life Polyamide 6 via Ring Closing Depolymerization. *ChemistrySelect*, *4*(43), 12638–12642.

Amoah, P., & Kosoe, E. (2014). Factors influencing solid waste management in developing countries: A review. *Journal of Environmental Science and Technology*, *7*(4), 193.

Bello, I., Ismail, M., & Kabbashi, N. (2016). Solid Waste Management in Africa: A Review. *International Journal of Waste Resources*, *6*(1–2).

Bhandari, P. (2020). An Introduction to Quantitative Research. Retrieved from Scribbr website: https://www.scribbr.com/methodology/quantitative-research

Bolaane, B. (2006). Constraints to promoting people centred approaches in recycling. *Habitat International*, *30*, 731–740.

Chanza, N., Nyahuye, A., & Moyo, F. (2017). Emerging Solid Waste Management Issues in Beitbridge Border Town: Evidence from A Participatory Approach. *International Journal of Advanced Research*, *5*, 771–781.

Chanza, N., Tevera, D., & Muchapondwa, E. (2017). Solid waste management in African cities: Sorting the facts from the fads. *Habitat International*, *60*, 137–144.

Chen, D. M.-C., Bodirsky, B. L., Krueger, T., Mishra, A., & Popp, A. (2020). The world's growing municipal solid waste: Trends and impacts. *Environmental Research Letters*, *15*(7), 074021.

Cherry, K. (2022). What Is a Case Study in Psychology? Retrieved from Verywell Mind website: https://www.verywellmind.com/how-to-write-a-psychology-case-study-2795722

Chinyama, A., & Chipangura, T. (2020). Solid waste management challenges in urban areas: A case study of Harare City, Zimbabwe. *Journal of Sustainable Development in Africa*, *22*(1), 36–49.

Cody, E. (2018). *Global Waste Generation*. New York, NY: World Bank.

Dinesh, G. H., Nguyen, D. D., Ravindran, B., Chang, S. W., Vo, D.-V. N., Bach, Q.-V., … Arun, A. (2020). Simultaneous biohydrogen (H2) and bioplastic (poly-β-hydroxybutyrate-PHB) productions under dark, photo, and subsequent dark and photo fermentation utilizing various wastes. *International Journal of Hydrogen Energy*, *45*(10), 5840–5853.

Ekanem, C., Ekanem, H., Eyenaka, F., & Isaiah, E. A. (2013). Zero Waste: An Innovation for Less Polluting Emission Processes, Resource Management Practices and Policies. *Mediterranean Journal of Social Sciences*, *5*.

Emenike, C., Iriruaga, E. T., Agamuthu, P., & Fauziah, S. (2013). Waste Generation in Africa: An Invitation to Wealth Generation. *Proceedings of the International Conference on Waste Management and Environment*. Kuala Lumpur, Malaysia: University of Malaya.

Emmanouil, C., Papadopoulou, K., Papamichael, I., & Zorpas, A. A. (2022). Pay-as-You-Throw (PAYT) for Municipal Solid Waste Management in Greece: On Public Opinion and Acceptance. *Sustainability*, *14*(22), 15429.

Environmental Management Agency. (2015). *Solid waste management*. Harare, Zimbabwe: Environmental Management Agency.

Environmental Management Agency. (2019). *State of Environment Report for Zimbabwe*. Harare, Zimbabwe: Environmental Management Agency.

European Commission. (2020). Waste and recycling. Retrieved from European Commission website: https://environment.ec.europa.eu/topics/waste-and-recycling_en

Ezeah, C., Roberts, C., & Byrne, J. (2013). A comparative analysis of municipal solid waste management in developed and developing countries. Waste Management. *Waste Management*, *33*(12), 2759–2768.

Fadhullah, W., Imran, N. I. N., Ismail, S. N. S., Jaafar, M. H., & Abdullah, H. (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. *BMC Public Health*, *22*(1), 1.

Farzadkia, M., Javid, A., Yazdanpanah, M., Dehghani, M., & Hassanvand, M. (2019). Status and determinants of household solid waste management in Iran: A systematic review. *Journal of Environmental Health Science and Engineering*, *17*(1), 105–119.

Gana, B. A., Babanyara, Y. Y., & Abdulkadir, A. (2022). Prospects of the Involvement of Stakeholders in Solid Waste Processing in Developing Nations. *Journal of Environmental Treatment Techniques*, *10*(1), 81–91.

García-González, A., & Reche, I. (2017). Trends and challenges in solid waste management. *Waste Management*, *27*, 410–417.

Gholampour, A., Khorramdel, S., & Lee, J. (2021). Life cycle assessment of municipal solid waste management strategies: An overview. *Science of the Total Environment*, *772*.

Gilbert, N., Ziqiang, Y., & Hongzhi, M. (2021). Current situation of solid waste management in East African countries and the proposal for sustainable management. *African Journal of Environmental Science and Technology*, *15*, 1–15.

Godfrey, L., Ahmed, M. T., Gebremedhin, K. G., Katima, J. H. Y., Oelofse, S., Osibanjo, O., … Yonli, A. H. (2019). Solid Waste Management in Africa: Governance Failure or Development Opportunity? In *Regional Development in Africa*. London, UK: IntechOpen.

Government of Zimbabwe. *Environment Management Act (Effluents and Solid Waste Disposal) Regulations*. , (2007).

Hasan, M. R., Mahumud, R. A., Khan, M. S., & Abedin, M. M. (2021). Sustainability challenges in solid waste management in developing countries: A case study of Dhaka, Bangladesh. *International Journal of Environmental Science and Technology*, *18*, 1521–1532.

Hoornweg, D., & Bhada-Tata, P. (2012). *What a Waste: A Global Review of Solid Waste Management Urban Development Series* (No. knowledge papers no. 15). Washington, DC: World Bank.

Integrated Sustainable Solid Waste Management in Asia. (2009). *Final Report Summary—ISSOWAMA (Integrated sustainable solid waste management in Asia)*. Berlin, Germany: Integrated Sustainable Solid Waste Management in Asia.

Iraguha, F., Ramelan, A. H., & Setyono, P. (2022). Assessment of current solid waste management practices, community perceptions, and contributions in the City of Kigali, Rwanda. *IOP Conference Series: Earth and Environmental Science*, *1016*(1), 012056.

Jensen, J. P., Prendeville, S., Bocken, N., & Peck, D. (2019). Creating Sustainable Value through Remanufacturing. *Journal of Cleaner Production*, *218*, 304–314.

Jribi, S., Ben-Ismail, R., Doggui, D., Debbabi, H., & Zairi, M. (2021). COVID-19 pandemic: Impact of lockdown on waste management. *Journal of Environmental Chemical Engineering*, *9*(6).

Kaza, S. (2020). Waste workers are protecting our communities during COVID-19. Retrieved from Word Bank website: https://blogs.worldbank.org/sustainablecities/waste-workers-are-protecting-our-communities-during-covid-19

Kaza, S., Yao, L., Van Woerden, F., & Bhada-Tata, P. (2018). *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. Washington, DC: World Bank.

Kgosiesele, E., & Zhaohui, L. (2010). An Evaluation of Waste Management in Botswana: Achievements and Challenges. *Journal of American Sciences*, *6*, 144–150.

Kotei, P., Annang, T., & Yirenya-Tawiah, D. (2020). Stakeholder Participation for Sustainable Solid Waste Management in Ga West Municipality, Accra – Ghana. *American Journal of Environment Studies*, *3*(1), 44–60.

Kubanza, N. S., & Simatele, M. D. (2020). Sustainable solid waste management in developing countries: A study of institutional strengthening for solid waste management in Johannesburg, South Africa. *Journal of Environmental Planning and Management*, *63*(2), 175–188.

Kumar, A., Dixit, G., & Prabhakar, D. (2016). Analyzing the Factors Affecting the Sustainable Municipal Solid Waste Management (MSWM). *Indian Journal of Science and Technology*, *9*.

Kumar, S., Smith, S. R., Fowler, G., Velis, C., Kumar, S. J., Arya, S., … Cheeseman, C. (2017). Challenges and opportunities associated with waste management in India. *Royal Society Open Science*, *4*(3), 160764.

Le, N. P., Nguyen, T. T. P., & Zhu, D. (2018). Understanding the Stakeholders' Involvement in Utilizing Municipal Solid Waste in Agriculture through Composting: A Case Study of Hanoi, Vietnam. *Sustainability*, *10*(7), 1–32.

Levine, D. (2018). *Municipal Solid Waste Management: A Roadmap for Reform for Policy Makers (English)*. Washington, DC: World Bank.

Lippiatt, B., & Ardakanian, R. (2017). *Achieving Zero Waste: A Case Study of San Francisco. Journal of Environmental Science and Sustainable Development*, 1(1), 1-11.

Makwara, E., & Snodia, S. (2013). Confronting the Reckless Gambling With People's Health and Lives: Urban Solid Waste Management in Zimbabwe. *European Journal of Sustainable Development*, *2*(1), 67–98.

Menon, V., & Palackal, A. (2021). Sustainability Contested: Analysis of Stakeholders Participation in Municipal Solid Waste Management—A Case Study. *Current World Environment*, *16*, 974–988.

Mensah, A., & Larbi, E. (2005). Solid Waste Disposal in Ghana. *Well Fact Sheet*.

Mishra, A. R., Pamučar, D., Hezam, I. M., Chakrabortty, R. K., Rani, P., Božanić, D., & Ćirović, G. (2022). Interval-Valued Pythagorean Fuzzy Similarity Measure-Based Complex Proportional Assessment Method for Waste-to-Energy Technology Selection. *Processes*, *10*(5), 1015. https://doi.org/10.3390/pr10051015

Muzenda, E., Manyuchi, M., Mbohwa, C., & Muzenda-Mudavanhu, V. (2018). The challenges of sustainable solid waste management in Zimbabwe's urban areas: A review of literature. *Journal of Sustainable Development*, *11*(3), 215–229.

Mwanza, B., & Phiri, A. (2013). Design of a waste management model using integrated solid waste management: A case of Bulawayo City Council. *International Journal of Water Resources and Environmental Engineering*, *5*(2), 110–118.

Obeng-Odoom, F., Danso-Abbeam, G., & Abavare, P. (2019). Gender and waste segregation and disposal behavior in Ghana. *Waste Management*, *94*, 1–10.

Olukanni, D. O., Adeleke, B. A., & Aremu, S. O. (2016). Public participation and stakeholder involvement in solid waste management in Nigeria. *Journal of Environmental Management*, *183*(1), 317–325.

Othman, M. S., Hussin, M. H., & Zainudin, W. M. A. (2021). Municipal solid waste management in Malaysia: Current practices, challenges, and opportunities. *Journal of Material Cycles and Waste Management*, *23*(1), 141–155.

Pahl, S., Sheppard, S., Boomsma, C., & Groves, C. (2014). Perceptions of time in relation to climate change. *Wiley Interdisciplinary Reviews: Climate Change*, *5*, 375–388. https://doi.org/10.1002/wcc.272

Plumtree Town Council. (2021). *Solid Waste Management*. Unpublished document.

Prah, J. K., Mensah, A., & Afful-Dadzie, E. (2019). T*he role of stakeholder involvement in sustainable solid waste management in developing countries:* A review. Journal of Sustainable Development, 12(2), 91-109.

Salam, M. A., Iqbal, M. Z., Rahman, M. M., Uddin, M. J., & Islam, S. (2020). Factors influencing solid waste management practices in urban areas of Bangladesh. *Environmental Science and Pollution Research*, *27*(10), 11054–11067.

Saunders, M. N. K. (2012). Choosing research participants. In G. Symon & C. Cassell (Eds.), *Qualitative Organizational Research: Core Methods and Current Challenges*. London, UK: Sage.

Shahabuddin, Q., & Rahman, M. (2017). Factors affecting household solid waste management in Dhaka city, Bangladesh. *Journal of Applied Sciences and Environmental Management*, *21*(5), 927–935.

Silva, M. A. M., Costa, J. A. V., Costa, C. M., & Leite, F. A. L. (2020). Stakeholder analysis of solid waste management in Brazil: A systematic review. *Resources, Conservation and Recycling*.

Sorooshian, S. (2013). Stakeholder involvement in solid waste management: A review of the literature. *Waste Management*, 1–9.

Strech, D., Mertz, M., Knüppel, H., Neitzke, G., & Schmidhuber, M. (2013). The full spectrum of ethical issues in dementia care: Systematic qualitative review. *The British Journal of Psychiatry: The Journal of Mental Science*, *202*, 400–406.

Thomas, K. V. (2022). Understanding the plastics cycle to minimize exposure. *Nature Sustainability*, *5*(4), 282–284.

Trivedi, R., & Dhanapal, R. (2017). Solid waste management: A review of current practices and future prospects. *Journal of Cleaner Production*, *159*, 664–676.

UN-Habitat. (2018). *Waste wise cities, A call for action to address the Municipal Solid Waste Challenge: RETHINK, ACT, ENGAGE*. Nairobi, Kenya: UN-Habitat.

United Nations Environmental Program. (2000). *Plastics science*. United Nations Environment Programme.

United Nations Environmental Program. (2019). *Solid Waste Management in Developing Countries*. Nairobi, Kenya: United Nations Environmental Program.

United States Environmental Protection Agency. (2018). *Solid waste management in the United States: Facts and figures*. Washington, DC: US Environmental Protection Agency.

Van der Werff, E., & Steg, L. (2016). The psychology of participation and interest in smart energy systems: Comparing the value-belief-norm theory and the value-identity-personal norm model. *Energy Research & Social Science*, *22*, 107–114. https://doi.org/10.1016/j.erss.2016.08.022

Verma, A., & Goel, A. (2017). Stakeholder involvement in solid waste management in India. *International Journal of Scientific Research and Management*, *5*(1), 1630–1634.

Wang, K., Zhao, X., Peng, B., & Zeng, Y. (2020). Spatio-temporal pattern and driving factors of municipal solid waste generation in China: New evidence from exploratory spatial data analysis and dynamic spatial models. *Journal of Cleaner Production*, *270*, 121794.

Wang, R., & Lin, E. (2009). Stakeholder engagement in sustainable solid waste management. *Waste Management, 29*, 944–951.

World Bank. (2021). Public-Private Partnerships in Solid Waste Management. Retrieved from World Bank website: https://ppp.worldbank.org/public-private-partnership/library/private-sector-participation-municipal-solid-waste-management-guidance-pack-5-volumes

Yoder, S. M. (2011). *Deconstruction as a learning tool*. *Cardinal Scholar*.

Zimbabwe National Statistics Agency. (2016). *Zimbabwe: Demographic and Health Survey 2015*. Harare, Zimbabwe: Zimbabwe National Statistics Agency.

ZIMSTAT. (2019). *The 2019 Multiple Indicator Cluster Survey*. Harare, Zimbabwe: Zimbabwe National Statistics Agency.

APPENDICES

APPENDIX A

QUESTIONNAIRE

My name is Yvonne Ndiweni a Masters's student at Adventist University of Africa, Kenya, doing a Master's in Public Health. I am researching "An assessment on factors affecting solid waste management practices: A Case of Plumtree Town, Zimbabwe." I, therefore, seek your assistance by way of completing the questionnaire. Your responses will be treated with confidentiality and the findings are for academic purposes only. After completing the questionnaire, please hand it to the researcher. Your co-operation will be greatly appreciated.

SECTION A: DEMOGRAPHICS

INSTRUCTIONS

Gender

Male	
Female	

1. Age

Below 21 years	
21 – 30 years	
31-40 years	
41-50 years	
Above 50 years	

2. Level of Education

Primary	
O Level	
A Level	
Vocational Training	
Diploma / Certificate	
University Graduate	
Other	

If other, Specify……..

3. Residential Area

Low-Density Area	
Medium Density Area	
High-Density Area	

4. Type of Waste Generated by Household

Food Debris	
Plastics	
Glass Bottles / Cans	
Old fabric	
Yard trimmings	
Biomedical waste such as sanitary pads.	

SECTION B

Please respond to the following questions by ticking (✓) the extent to which you agree or disagree with each of the statements given as follows:
5 Strongly Agree, 4 Agree, 3 Neither Agree nor Disagree, 2 Disagree, 1 Strongly Disagree.

Question	**1**	**4**	**3**	**2**	**1**
Solid Waste Management Practices					
2. I do compost at my house as a way of processing biodegradable waste					
3. Hazardous waste is separated and handled with great care at the generation level					
4. Landfilling of waste is done after separation					
5. Non- biodegradable waste like plastic, metal parts, glass bottles, fiber, etc. are reused or sold to recyclers					
6. There is regular transportation of solid waste					
7. There are appropriate disposal sites for solid waste					
8. There is the separation of waste at the source					
9. There are two bins at each location/home/organization one for biodegradable and the other for recyclable waste					
Enabling Environment					
10. I am willing to pay the suggested tariffs for solid waste management					
11. I can pay the suggested tariffs for solid waste management					
12. The excess use of plastic carry bags and pet bottles is controlled by legislation					
13. Plumtree Town Council enforces legislation and policies that relate to solid waste management.					
14. As individuals/organizations we have modified our current practices to reduce the amounts of solid waste generated					
15. Organizations in Plumtree Town donate products or materials to others for re-use as a way of reducing solid waste					
16. Our government supports the implementation of any solid waste project					
17. Improved waste management services have been implemented at Plumtree Town					
18. We have been informed about our duties toward proper solid waste management					
19. I am motivated and willing to participate and contribute to the process and the objective of solid waste management improvement.					
20. Plumtree Town Council implements legislation concerning solid waste management and punishes violators					
Stakeholder Involvement					
21. I now do proper solid waste management practice					
22. I am concerned about waste generation at the point of purchase and consumption					
23. There are community-based recycling organizations					

24. In our community, there is a promotion of waste segregation					
25. As a community, we do house-to-house waste collection/organized scavenging					
26. In our community, there are awareness programs to disseminate information to the public and to promote public Participation in proper solid waste management practices					
27. In Plumtree Town, we have Recycling Industries that purchase waste resources from the public, communities, and local government.					
28. Environmental Management Administration (EMA) staff randomly checks residents' waste bags at collecting points.					
29. Organizations and households are encouraged to volunteer to participate in solid waste reduction					
30. Plumtree Town Council provides adequate waste bins for each home					
31. Plumtree Town Council gives its residence bin liners to separate waste					
32. Plumtree Town Council instructs people on how to sort their waste properly					
33. Plumtree Town Council is repairing and replacing bins as and when required					
34. Plumtree Town Council insists on the segregation of waste at the generation level.					
35. Plumtree Town Council practices modern waste disposal techniques to minimize environmental damage					
36. The Government implemented an environmentally sound solid waste disposal system and improved the waste disposal capacity of local government agencies					

APPENDIX B

INFORMED CONSENT FORM

Student researcher: Ndiweni Yvonne Duduzile
Title of project: An assessment of factors affecting solid waste management practices: A case of Plumtree Town, Zimbabwe.
I am taking this study as a requirement of the Master in Public Health Degree program that I am undertaking at the Adventist University of Africa. I am asking for your voluntary participation in my research work. Please read the following information about the research and if you would like to participate, please sign in the appropriate box below.
Purpose of the research project: To assess the factors affecting solid waste management practices: The case of Plumtree Town, Zimbabwe, and give appropriate recommendations on safeguarding and improving the environment and populations' health.
Time required for participation: You will need roughly one hour to answer the questionnaire
Risks: This research has no conspicuous risks, yet you may encounter some discomfort from the personal questions being inquired
Benefits: With the recommendations that will be made after the research; policies can be changed to protect the environment and Plumtree Town community and prevent ill health.
How confidentiality will be maintained: Any information that is given by you will be viewed as private, and it will be accessible just to the researcher. Information you give will not be discharged without your consent. After the study, it will be destroyed.
If you have any questions about this study, feel free to contact me at +263712315933. Email ndiweniy@aua.ac.ke
Voluntary participation: Participation in this study is completely voluntary. If you decide not to participate there will not be any negative consequences. Please be aware that if you decide to participate, you may stop participating at any time and you may decide not to answer any specific question.
By clicking the agree button on the online questionnaire means I am attesting that I have read and understand the information above, and I freely give my consent/assent to participate or permission for my child to participate.
Adult informed consent:
Date reviewed _____Signed: _____
Printed Name (Optional): _____

APPENDIX C

PICTURES

Dumping - Plumtree, Zimbabwe. Ndiweni, Y D (Photographer). (2020, May).

CURRICULUM VITAE

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CAREER SUMMARY

Client-focused public health professional with a passion for promoting health, preventing diseases, prolonging the life of the population, and developing, facilitating, and promoting education in public health with legal ethical, moral, and professional standards. With an outstanding ability to manage time, solve problems, and be committed to achieving goals and objectives in fast-paced and high-volume organizational practices pursuing a rewarding role. Strong interpersonal skills, multi-skilled, self-driven, confident, result oriented, smart, and presentable with excellent knowledge in Public Health, Environmental Health, Occupational Safety and Health, and Nursing. Mature, dedicated, self-motivated, and willing to stretch to greater heights.

PROFESSIONAL EXPERIENCE:

FIELD OFFICER: WASH June 2020 -December 2021

Duties and Responsibilities

Intensify behavior change through community programs and awareness-raising strategies for hand washing at the individual, household, and institutional levels.
Strengthen infection prevention and control (IPC) at the household and in institutions
Guarantee the sustainability, affordability, capacity building, and safety of water and sanitation services.
Improve awareness of COVID-19, safe hygiene, and sanitation practices, with a focus on participatory health and hygiene education (PHHE) in high-risk communities (bus terminus, churches, marketplaces, other public places, etc.) Monitor the area's operational activities and provide feedback to the Management.
Advising the WASH team in WASH promotion programming, in broad coordination with other sectors.
Design, implement, and document meetings, workshops, seminars, training, and other events related to the program's/project's field of activities.
Analyzing the baseline study data to determine the underlining needs of the beneficiaries
Advising on mainstreaming GBV, PSEA, and AAP in project and program activities
Formulate project action plans and synchronize between the planning and budgeting system
Develop technical concepts, guidelines, manuals, and procedures, which are ready to be applied

Major Accomplishments

- Fraud Awareness Certificate,
- Prevention of Sexual Exploitation and Abuse UNICEF online training,
- Designed project monitoring tools for Community Health Clubs,

- Borehole Handle Disinfection and Handwashing facility monitoring,
- Designed online reporting forms for ZWE1147 and UNICEF weekly reports.

ENVIRONMENTAL HEALTH AND SAFETY OFFICER, March 2017 to December 2018.

Duties and Responsibilities

- Occupational Safety, Health, and Environment- Safety talks with refuse collection, street sweepers, and the grave diggers team daily in the morning.
- Purchase the appropriate PPC/E for the employees.
- Organizing SHE meetings with departmental leaders and the safety committee monthly.
- Involved in the SHE Policy writing, implementation, and review.
- Safety training, awareness campaigns, competitions, and workplace inspections.
- Hazard Identification, classification, and mitigation procedures.
- Reporting and recording workplace accidents in appropriate registers and authorities.
- Routine Public Health Inspections for all public premises within Plumtree Town with special attention to food handling procedures and general hygiene standards concerning the Public Health Act, Foods and Food Standards Act, and the Environmental Management Act.
- Environmental Health Fitness inspections for new premises and annual business license renewals.
- Solid and Hazardous Waste Management
- Building plans examinations and Inspections
- Disease Monitoring and Surveillance

Major Accomplishments

Formulation of the Occupational, Safety, and Health Policy in Plumtree Town Council.

VOLUNTEER- UYANAKA TRUST June 2015 – to date

Duties and Responsibilities

- Develop and supervise the implementation and regular review of the strategic plan within the context of UYANAKA's Mission, Beliefs (values) and Operating Principles.
- Identify orphans and vulnerable children in the two districts of Bulilima and Mazowe and assist with food, fees, stationery, clothes, and psychosocial support.
- Report on the implementation of the strategic plan at each board meeting and coordinate the design and development of specific projects and the associated writing of proposals, in harmony with the organization's strategic plan and established quality standards.
- Plan appropriately to ensure the continuity of program funding to meet strategic objectives.
- Plan programs from inception to completion according to the scope of the project involving deadlines, milestones, and processes as well as developing or approving budgets and operations.
- Proactive planning of the programs and source funding.
- Compiled monthly and quarterly reports for UYANAKA and presented to the team and funders.

Major Accomplishments

- Sourced funds and managed to pay tuition fees for 75 orphans and vulnerable children in 2020.
- Bought uniforms and stationery for 21orphans in 2020 and 2021.
- Currently feeding 10 orphans and vulnerable children, daily at Solusi Primary School.

Primary Care Nurse, Ministry of Health, and Child Care; Solusi Clinic- 2008 to 2015

Duties and Responsibilities

- Curative management of disease to the patients.
- EPI outreach programs to hard-to-reach areas.
- Ordering supplies for patients from the pharmacy.
- Conduct HIV testing and counseling.
- Collecting samples from patients and sending them to the district laboratories.
- Conducting maternity duties and monitoring neonatal up to 3days post delivery
- Assisting patients and escorting them to the referral centers.
- Sorting patients' files and updating the necessary registers timely.

SKILLS

- Thorough and attentive to details; able to prioritize and multitask; proactive and deadline oriented.
- Computer literate with a good working knowledge of Microsoft Excel, Word, and Outlook.
- Capable of managing a varied workload, and able to operate in complex but fascinating contexts.
- Very good analytic skills.
- Excellent writing skills with the ability to target different audiences and tailor output accordingly.
- Dynamic, passionate, and creative communicator.
- Ability to create and keep deadlines.

EDUCATION

Post Graduate Diploma in Water Supply and Sanitation: IWSD 2022 - Current
Master in Public Health- Specialization in Environmental Health: Adventist University of Africa- Kenya 2018 - Current
Bachelor of Science Degree in Environmental Health: Solusi University 2018
Prevention of Sexual Exploitation and Abuse (PSEA): UNICEF 2020
Certificate in Occupational Safety, Health, and Environmental Management Course, (OSHEMAC) Part I & Part II: NASS 2016
Certificate in Occupational Safety, Health and Environmental Management System and Implementation (OSHAS18001): Standard Association of Zimbabwe 2017
Certificate in HIV/AIDS Care and Counselling: UNISA 2010
Certificate in Primary Care Nursing: Inyathi District Hospital 2008
Certificate in Effective Communications for Healthy Outcome: YALI 2018
Certificate in Strategies for Personal Growth and Development: YALI 2018
Certificate in Understanding Climate Change: YALI 2018
Certificate in Fundamentals of Grant Writing: YALI 2018

References:

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