

MIDLANDS STATE UNIVERSITY

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

APPROVAL FORM

The undersigned certify that they have read and recommended to the Midlands State University for acceptance a dissertation entitled: **The solid waste management in Mubaira growth point, Chegutu Rural District Council**

By

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Submitted in partial fulfilment of the requirements of a BSc Honours Degree in Geography and Environmental Studies

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DECLARATION

I do confirm that this is my own piece of work and the use of material from other sources has been properly and fully acknowledged.

DEDICATION

I dedicate this piece of work to my beloved family Mr. and Mrs. Takaedza, Faith and Simbarashe Takaedza. I can never imagine what it would have been like without you. You have been my pillars of strength and source of inspiration throughout.

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Above all, I give Glory unto the Almighty for without Him, I would not have been, for all things are made through Him. It was never by my mighty nor power that I lived up to the completion of this project, but it is God who saw me through it all (**Phil 4: 13**, I can do all things through Christ which strengtheneth me.)

ABSTRACT

Solid waste management has been a topical issue in the urban centres of most developing countries including Zimbabwe. This has posed serious environmental challenges in the cities of Zimbabwe. However, this issue has concentrated on solid waste management in the urban areas leaving out the rural areas. Solid waste generation in the rural areas has since increased both in quantity and quality due to modernization. Solid waste composition in the rural areas has been known to be dominated by organic materials with only a small proportion making up the inorganic waste. This is no longer the case in present day as more inorganic wastes are being produced in rural areas than organic wastes. Previous research has concentrated on solid waste management in the large cities of Zimbabwe like Harare and Gweru, very little has been done on rural solid waste management. To address this knowledge gap, a research study was conducted in Mubaira growth point under Chegutu District. The goal of this study was to investigate the solid waste management system in place in Mubaira so as to assess its effectiveness. It meant to analyse the whole process from waste generation, storage, collection, transportation to disposal. The people's perceptions and attitudes towards waste practices such as reuse, recycling and waste separation were also investigated. A total of 100 questionnaires were administered to the two main target populations in Mubaira which were the residential/ households and the business premises target populations. Stratified-systematic sampling was used in selecting the respondents for the households target population, whilst purposive sampling was used for selecting respondents in the business premises target population. Interviews, focus group discussions as well as field observations were also used in this study. The study revealed that the solid waste management system in Mubaira is inefficient as shown by the erratic waste collection system, emergence of illegal and environmentally unfriendly waste management practices which include burning and open dumping. It was gathered that solid waste management practices like recycling, reuse and waste separation are not being practiced effectively in Mubaira which exacerbated the problem of solid waste management. In light of this research, it was recommended that Chegutu Rural District Council come up with an Integrated Solid Waste Management system best suited to Mubaira growth point. It was also recommended that Environmental education and campaigns be conducted on a regular basis so as to educate the public on the importance of proper solid waste management and also to consult members of the public when making decisions that affect them. This would reduce the level of resistance in the implementation stage.

ACRONYMS

Aug	August
CEO	Chief Executive Officer
EMA	Environmental Management Agency
<i>et al.</i>	And others
Feb	February
HR and Admin	Human Resources and Administration
Jan	January
NGOs	Non-governmental organizations
Nov	November
Oct	October
RDC	Rural District Council
UNCHS	United Nations Centre for Human Settlement
UNEP	United Nations Environmental Programme

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CHAPTER 1: INTRODUCTION

1.1 Background of the study

Solid waste is defined as all unwanted materials that are not liquid or gas and cannot be disposed through air (Feresu, 2010). Solid waste management (SWM) may be defined as that discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations (Tchobanoglous *et al.*, 1993).

In ancient history, the amount of waste generated by humans was insignificant due to low population densities as well as societal levels of exploitation of natural resources. Common wastes produced then were mainly ashes and human biodegradable wastes which were released back into the ground locally, with minimum environmental impact. Tools made out of wood and metal were generally re-used or passed down through generations. However, some civilisations do seem to have been more reckless in their waste output than others. In particular, the Maya of Central Africa had a fixed monthly ritual in which the people of the village would gather together and burn their rubbish in large dumps.

In ancient cities, wastes were thrown onto unpaved streets and roadways where they were left to accumulate. The first known law that was put up forbidding this practice was established in 320 BCE in Athens. At that time, a system for waste removal began to evolve in Greece and in the Greek dominated cities of the Eastern Mediterranean. In ancient Rome, property owners were responsible for the cleaning of streets directly in front of their property. Organised waste collection was only associated with state sponsored events such as parades. Disposal methods were very crude, involving open pits located just outside the city walls. As populations increased, efforts were made to transport waste farther out from the cities (Encyclopaedia Britannica, 2012).

With the onset of industrialisation and the sustained urban growth of large population centres in England, the build-up of waste in the cities caused the rapid deterioration in levels of sanitation and the general quality of urban life. The streets became choked with filth due to lack

of waste clearance regulations (Nightingale, 1954). Calls for the establishment of a municipal authority with waste removal powers were mooted as early as 1751 by Corbyn Morris in London.

A technological approach to solid waste management began to develop in the latter part of the 19th century. A significant development in solid waste treatment and disposal practices was marked by the construction of the first refuse incinerator in England in 1874. By the beginning of the 20th century, 15 percent of major American cities were incinerating solid waste. Technological advances continued during the first half of the 20th century, including the development of garbage grinders, compaction trucks and pneumatic collection systems (Encyclopaedia Britannica, 2012).

Improper SWM leads to substantial negative environmental impacts (for example, pollution of air, soil and water and generation of greenhouse gases from landfills as well as health and safety problems) such as diseases spread by insects and rodents attracted by garbage heaps and diseases associated with different forms of pollution. Cities in both developed and developing countries generally do not spend more than 0.5% of their per capita Gross National Product (GNP) on urban waste services, which covers only about one-third of overall cost (World Bank, 1999). The responsibility over solid waste collection is thus well beyond the capacity of local governments. More than 80% of the total waste management costs in low-income countries are collection costs (World Bank, 1999).

Municipal SWM constitutes as one of the most crucial service provision challenges facing African towns and cities (Achankeng, 2003). SWM operations currently absorb 30 to 50% of the municipal operating budgets in developing countries (Earth Summit, 1992). In Zimbabwe, SWM has emerged as one of the major challenges confronting almost all urban local authorities. Due to the economic meltdown experienced in Zimbabwe during the ten years between 2000 and 2010, many challenges militated against sound urban SWM (Musadamba *et al.*, 2011). In Zimbabwe, according to the Agenda 21 document chapter 21 which talks about environmentally sound management of solid wastes and sewage related issues, it was made clear that the national priority is to minimise environmental pollution from solid waste disposal sites and from sewage disposal practices.

Globally, there is a lack of knowledge about Solid Waste Management in rural areas as most studies have been mainly concentrating on solid waste management in urban centres. This has left most rural local authorities without information on how to properly manage solid waste in rural settings. In most instances, there has been a fallacy of underestimating the problems of solid waste management in rural areas. This has left most rural communities faced with the various problems of solid waste management. This study focuses on the solid waste management system implored at Mubaira growth point, a rural setting in the Chegutu District of Zimbabwe. The aim is to establish sustainable solid waste management systems for the effective management of solid waste in the rural areas of Zimbabwe for both humanity and the environment's benefit.

1.2 Statement of the problem

Solid waste management has become a major public health and environmental concern in urban as well as rural areas of many developing countries. In Zimbabwe, particularly the rural areas where the issues of solid waste management have received less attention as compared to the urban environments, the magnitude of the problems being faced due to improper SWM cannot be understated. Open dumping and burning of municipal solid waste is a common phenomena in most of the growth points and service centres under Chegutu Rural District Council. Health hazards posed by the vermin from open dumps and unsupervised scavenging of these sites are leading to toxic releases to both air and groundwater. These have contributed to long lasting damage to the environment and have presented serious implications on the health of local people and livestock. Due to the increase in the movement of people to and from rural areas, the types of solid wastes that are now found in Mubaira rural setup are more or less similar to the kind that is more popular in urban areas. Rural areas were known to produce more organic than inorganic waste but things have since changed. Waste is becoming more inorganic even in rural areas. The accumulation of municipal solid waste pose a health threat to people, plus the decaying wastes also attract household pests and result in rural areas becoming unhealthy, dirty and unsightly places to reside in. Mubaira growth point is one such area that has been suffering from the negative impacts associated with solid waste, which is managed by the local authority- Chegutu Rural District Council.

1.3 Objectives

1.3.1 General objective

- To assess the effectiveness of the solid waste management system at Mubaira growth point

1.3.2 Specific Objectives

- To evaluate the solid waste management system operational within Mubaira growth point
- To determine the effectiveness of the solid waste management system by Chegutu Rural District Council at Mubaira
- To determine the environmental and health impacts posed by ineffective Solid Waste Management at Mubaira
- To establish a workable solid waste management system that can be adopted by Chegutu RDC and any other rural local authorities

1.4 Justification of the study

Solid waste management is a civic problem and it has to evolve optimally and continuously to serve the future generations. Solid waste if unchecked can not only be a health hazard, but will impart multi-dimensional threats, which include serious detrimental, environmental, social and economic impacts. According to the Earth Summit 1992, the trend of unsustainable patterns of production and consumption is increasing the quantity of the waste and the amount will increase four to five fold by the year 2025. Also, as many as 5,2 million people, including 4 million children under five years of age, die each year from waste related diseases. Solid wastes have the potential to pollute all the vital components of the living environment, that is air, land and water (Mansooret *al.*, 1999). The issues of solid waste management have received very little or no attention especially in rural settings where discharge is still believed to be relatively low as compared to an urban setting and the rate of assimilation considered uptight. A closer review of this statement with a case study of Mubaira rural setting has shown that this is no longer the case, especially in this industrialised economy where rural settings are fast turning into urban centres. This has a direct influence on the quantity and quality of municipal solid waste being discharged

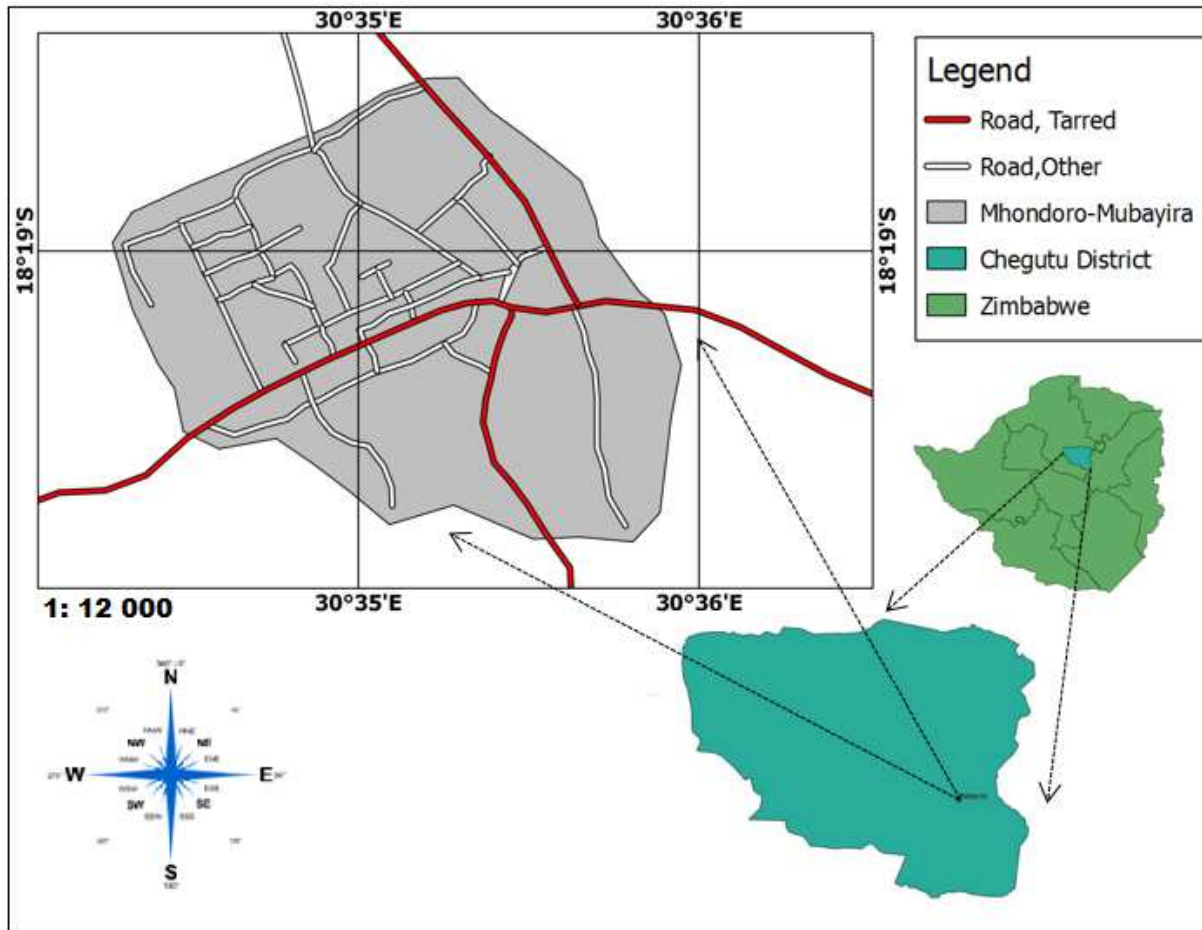
in rural areas nowadays. Unlike in the old days, were the composition of municipal solid waste in the rural areas was mainly ash and human biodegradable food remains, solid waste in rural areas now adays comprise of things like bottles, cans, plastics, cardboard as well as food stuffs. Mubaira being an area that is fast turning into an urban centre has been producing more waste in terms quantity as well as quality. This then means that the solid waste management methods that were being used before have to be revised so as to suit the present time. The local authority responsible should come up with a holistic approach to solid waste management so as to deal with the multiple health and environmental errors being presented by the ineffective solid waste management system in place at the moment. Service provision in the rural areas is basically poor as compared to urban centres. Examples of these in Zimbabwe's rural areas include poor road maintenance, poor communication lines, poor water supplies also to include poor solid waste management systems. Local government authorities have been focusing on the development of urban centres so much at the expense of developing rural centres. More attention is given in terms of service provision, grants and loans to improve already developed urban areas at the expense of rural centres. This research will try to bring out the importance of improving the quality of service provision in rural areas so as to attract investors for rural development. This study will also try to identify the problems being faced by Chegutu Rural Ditsrict Council in managing solid waste in Mubaira in order to come up with a panacea to the problems being brought about by the ineffectiveness of the system. This study is also meant to come up with a workable solid waste management system that could be adopted by Chegutu Rural District Council and any other rural councils that are facing problems of waste management. This research will not only help councils but also the Ministry of Local Government as well as the Ministry of Environment and Natural Resources Management in policy designing and implementation.

1.5 Study Area

The research would be undertaken at Mubaira growth point in Chegutu District. Mubaira falls under, Mhondoro- Mubaira Constituency in Mashonaland East Province. Mhondoro- Mubaira is a constituency that was hived off from Mhondoro Constituency. It is made up of Mubaira Growth Point, Marisamhuka, Watyoka, Denga, Chakara and Monera. People in the constituency rely on agriculture for survival. The constituency has a total population of approximately 52770

people which is female dominated, with 27720 females against 25050 males. The constituency has about 11933 households with an average of 4 people per household.

The Mhondoro region suffers from the problem of desertification mainly as a result of widespread erosion due to deforestation, uncontrolled cultivation and overgrazing of rangelands. The vegetation type that is found in Mubaira is that of the tropical savannah climate and the soil type that is dominant is sandy loam soil which is susceptible to erosion.



Source: Department of Geography and Environmental Studies (2014)

Fig 1.0 Mhondoro- Mubaira, Chegutu District

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter seeks to give literature review of solid waste management. Various sources of literature on solid waste management were consulted so as to shed more light on the discussion from a global perspective down to issues of solid waste management in Zimbabwe.

2.2 Main solid waste types and their classification

Solid waste can be classified into different types depending on their source. The three main types of solid waste are household waste which is generally classified as municipal waste, industrial waste as hazardous waste and biomedical waste or hospital waste as infectious waste.

Municipal/household solid waste consists of household waste, construction and demolition debris, sanitation residue and waste from streets (Prakriti, 2006-7). This waste is mainly generated from residential and commercial complexes. Due to the rise in urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been rapidly increasing and its composition changing.

Hazardous wastes could be highly toxic to humans, animals and plants, are corrosive, highly inflammable or explosive and react when exposed to certain things, for example gases (Prakriti, 2006-7). Certain types of household waste can also be hazardous. Industrial and hospital waste is considered hazardous as in some cases they contain toxic substances. Paint tins, shoe polish and medicine bottles are household wastes that can be categorized as hazardous waste. Hazardous waste in the industrial sector is mainly from metal, chemical, paper, pesticide, dye, refining and rubber industries.

Hospital waste is that which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities in these fields or in the production or testing of biologicals (Prakriti, 2006-7). Wastes may include disposables, anatomical waste, sharps, soiled waste, chemical wastes etc. These wastes are in the form of swabs, bandages, disposable syringes, body fluids etc. Hospital waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner.

Waste classification is important in that it helps those involved in the management and treatment of waste for disposal to ensure the environmental and human health risks associated with it are managed appropriately and in accordance with the associated environmental regulations. Classifying wastes into groups that present similar risks to the environment and human health facilitates their management and appropriate disposal. Six waste classes of waste are normally used namely, special waste, liquid waste, hazardous waste, restricted solid waste, general solid waste (putrescible) and general solid waste (non-putrescible), (Department of Environment, Climate Change and Water NSW, 2009).

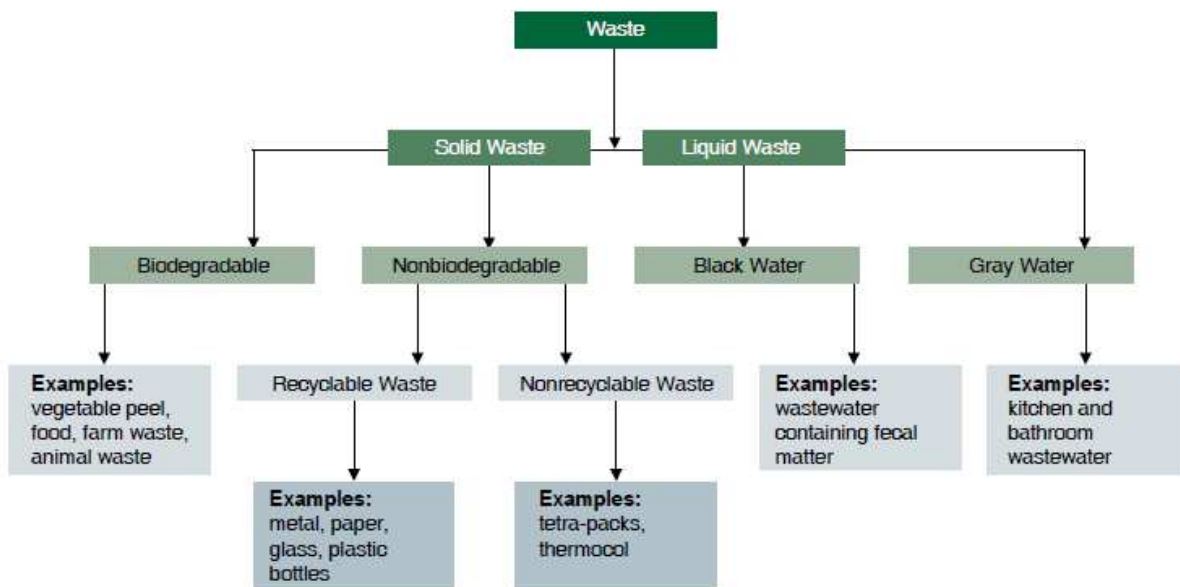


Table 2.01: Waste flow diagram

2.3 The Status of Global Solid Waste Management

Solid waste management is a major challenge in urban areas throughout the world. The increasing volume and complexity of waste associated with the modern economy is posing a great risk to ecosystems and human health. An estimated 11.2 billion tones of solid waste is collected yearly worldwide and decay of the organic proportion of solid waste is contributing about 5% of global green house gases emissions. A research conducted by the World Watch Institute, an independent research organization reported that rising prosperity and the increasing

urbanization of the world could double the volume of municipal solid waste created annually by 2025.

Globally, people are discarding growing quantities of waste and its composition is more complex than ever before as plastic and electronic consumer products diffuse. These trends pose a challenge to cities, which are charged with managing waste in a socially and environmentally acceptable manner. Key waste management challenges include integrating the informal waste sector in developing cities, reducing consumption in industrialized cities, increasing and standardizing the collection and analysis of solid waste data and efficiently managing increasingly complex waste while protecting people and the environment.

Globally it can be noted that issues to do with solid waste management have raised a lot of concern as more waste is being produced daily and the waste becoming more complex by the day. It can also be noted that the problems are more concentrated in the third world countries as they do not have the capacity to engage in more complex solid waste management strategies. .

2.4 Solid Waste Management in Developing Countries

Increasing population levels, booming economy, rapid urbanization and the rise in community living standards have greatly accelerated the municipal solid waste generation rate in developing countries (Mighuaet *al.*, 2009). Responsible authorities, usually municipalities, who are responsible for waste management, have had challenges in trying to provide an effective and efficient system to residents due to lack of organization as well as financial resources. Solid waste management is a challenge for the cities' authorities in developing countries mainly due to the increasing generation of waste, the burden on the municipal budget as a result of the high costs associated with its management, the lack of understanding over a diversity of factors that affect the different stages of waste management and linkages necessary to enable the entire handling system functioning (Guerrero *et al.*, 2013).

It has been reported that developing nations spend some US \$46 billion on managing their municipal solid waste every year and these investments could exceed US \$150 billion per year by 2025. Lefilleur (2012), reported that public authorities in developing countries are finding it difficult to raise the necessary finance to meet these costs. Often they are compelled to concentrate on urgent needs, that is, collection to the detriment of processing with the result

being that they incur high costs while achieving poor performances. The Millennium Development Goals set targets for Environmental Sustainability and Access to Environmental Sanitation, but safe disposal of solid waste still seems beyond the capacity of many countries (Ali *et al.*, 2005).

A typical solid waste management system in a developing country displays an array of problems, including low collection coverage and irregular collection services, crude open dumping and burning without air and water pollution control, the breeding of flies and vermin and the handling and control of informal waste picking or scavenging activities (Ogawa 2008). These problems are a result of various factors which hinder the development of effective solid waste management systems. These factors range from technical, institutional, financial, economic to social constraints.

Adequate administrative and financial resources seem to be the main problem hindering the proper management of municipal solid waste management in many developing countries. No clear reliable framework is available by which the solid waste sector is administered from the collection, transportation to disposing or treatment phases. This is often coupled with limited investment allocated for the municipal solid waste sector with complications of collecting or raising proper service fees.

In most developing countries, there is a lack of human resources at both national and local levels with technical expertise necessary for solid waste management planning and operation. Many officers in charge of solid waste management, particularly at local level, have little or no technical background or training in engineering or management (Bartone 1995). Generally, solid waste management is given a very low priority in developing countries especially in small cities and rural areas. This results in governments providing very limited funds to the solid waste management sector, hence the levels of services required for protection of the public health and environment are not attained.

There is lack of effective legislation for solid waste management in most developing countries. Legislation related to solid waste management in developing countries is usually fragmented and several laws (for example, Public Health Act, Local Government Act, Environmental Protection Act etc) include some clauses on rules/regulations regarding solid waste management

(Bartone 1995). The rules and regulations are enforced by different agencies and often there is duplication of responsibilities by these agencies.

Due to weak economic bases of the developing countries, there are insufficient funds for sustainable development of solid waste management systems. Studies conducted in developing countries showed that same old non-environmentally sound practices are still being used. In urban areas of most developing and less developed countries generated municipal solid waste is at best collected and dumped in arbitrary dumpsites that mostly lack the appropriate norms. In other countries, dumping of municipal solid waste into water bodies, wetlands as well as burning to reduce its volume is the norm. Such practices have their adverse impacts which range from environmental to creation of health problems.

Although lots of significant efforts have been done in the last few decades in many developing countries supported technically and financially by developed countries and international organizations, substantial reforms in the management of municipal solid waste are still not attained (Khatib, 2011).

2.5 Waste Management in Zimbabwe

Solid waste management has emerged to be a major challenge to most urban and rural local authorities in Zimbabwe. In Zimbabwe, rapid urbanization in the last decade, coupled with economic decline and social disruption placed considerable strain on local authorities' resources, resulting in their failure to provide adequate services to residents (Training and Research Support Centre, Civic Forum on Housing, 2010). By the year 2009, most residents were grumbling about waste management and the social problems which were brought about by waste dumping. The Practical Action Southern Africa (2006) reported that more than 2,5 million tonnes of household and industrial waste are produced per annum in urban areas across Zimbabwe. It also reported in 2007 that waste collection by local authorities dropped from 80% of the total waste across different local authorities in the mid 1990s to as low as 30% of total waste in some large cities and small towns in 2006 (Practical Action 2007).

According to Mangunduet *al.* (2013), the attainment of independence in 1980 by Zimbabwe saw the easing of colonial policies which were restrictive in terms of population movements especially the part of the black population in urban areas. This is said to have contributed to

rural to urban migration of people, most of them settling in the high density suburbs which were characterized by illegal dumping due to erratic waste collection systems (Kaseke 2005 ; Chidavaenzi 2006 ; Tsiko and Togarepi 2012). In Kaseke's view (2005), solid waste management has become a major problem in Zimbabwe's towns and cities and the problem is increasing due to urbanization, population growth, industrialization and increased use of non-biodegradable plastics and bottles (Mangunduet *al.*, 2013). In Zimbabwe, the Ministry of Local Government Rural and Urban Development 1995 mentioned that the major problem with collection is inappropriateness and shortages of vehicles for collection. In 1991, the Harare city council failed to collect refuse because only 7 out of its 90 trucks were operating. This was due to insufficient funds for training personnel and equipment maintenance (UNCHS 2001).

In May 2005, the government of Zimbabwe instituted a clean-up operation called “ Operation Restore Order” dubbed “ Operation Murambatsvina ” which when literally translated means ‘ No tolerance to dirt ‘, (Mangizvo 2007). The government's objectives in carrying out this exercise were to try and deal with the problem of waste in urban areas. This then led to the creation and adaption of an Environmental Management Act. The Environmental Management Act (CAP 20:27), (EMA CAP 20:27) ensures that there is sustainable management and protection of the environment. The Act makes it mandatory for people or organizations to discard litter only in containers provided for that purpose or places designated for such purposes (Mangizvo 2007). Despite these measures, residents have continued discarding litter outside the receptacles hence making government's efforts to maintain a clean environment void.

2.6 Challenges of Solid Waste Management in Zimbabwe

Poor municipal solid waste management is threatening the urban environments in the developing world (Hardoy, 2001). A common loophole often found in many municipal councils in dealing with solid waste management is that of lack of enforcement of legislation. Chenje(2000) argues that there are several legislations dealing with solid waste, however, the problem is the enforcement of these legislations. Teveraet *al.* (2002) contends that the fragmentation of government institutions tasked with enforcing legislation on solid waste management does not encourage sound environmental management.

Another challenge is that of lack of coordination among government ministries. According to Mangizvo 2007, different government ministries, such as the Ministry of Environment and Tourism, Ministry of Local Government and National Housing, Ministry of Education and Culture, Ministry of Higher Education and Technology and the Ministry of Health and Child Welfare had environmental provisions which were rigid and sector based. For instance, the Public Health Act is under the Ministry of Health and Child Welfare whilst the Natural Resources Act is under the jurisdiction of the Ministry of Environment and Tourism. As a result, the management of solid waste lacks uniformity and coordination of areas of responsibility.

The attitudes of residents also contribute to challenges of solid waste management in Zimbabwe as they are contributing to littering. According to Tevera(1994), the throw away attitude, which is common in the western world has caught up with people in Zimbabwe. The lack of knowledge and information about waste source reduction, recycling and waste management is a serious obstacle to the efforts of urban councils in developing countries like Zimbabwe, to reduce waste related problems(Manyahireet *al.*, 2009).

2.7 Waste collection, transfer and disposal in Zimbabwe

Jonsson (1991), posited that a few cities in the developing world have adequate waste collection and disposal systems. According to Hardoyet *al.* (1993), between 30% and 50% of solid waste generated within urban centres in the third world countries remains uncollected. This is true in the case of Zimbabwe when one looks at the erratic waste collection, transfer and disposal system currently being experienced all over the country. Waste is rarely collected in time resulting in excess waste which is normally dumped on roadsides and open spaces by the public. Burning of waste has become an almost normal habit to residents in most towns of Zimbabwe, not mentioning the rural areas because the responsible authorities are failing to carry out their duties. Harare's capital city which was once dubbed the "sunshine city" due to its cleanliness has since lost its shine due to the excessive waste heaps lying around even in the CBD unattended.

According to Mangizvo(2007), in Zimbabwe about 60% of the municipal solid wastes generated in cities is transported to the dumpsites. The wastes which are not transported to official disposal sites are usually dumped illegally in undesignated areas such as storm water drains, open spaces, alleys and road verges, (Masocha and Tevera, 2003). In the cities of

Zimbabwe as well as rural growth points, such practices as mentioned by Masocha and Tevera have become rampant.

Waste disposal is the throwing away or dumping of unwanted material through landfilling on dumpsites, incineration and composting among other methods, (Miller 1996:189 ; Michaels 2002:14). Most urban areas in the developing world use the crude dumping system to dispose of their solid waste (Mangizvo, 2008). According to Masocha (2002), in Zimbabwe at least 60% of municipal solid wastes generated in large cities are dumped at crude also known as open disposal sites that do not meet basic environmental standards. Chidavaenzi (2006) said that, most of the collected municipal solid waste is disposed of in open dumps and almost half the wastes generated do not reach the designated disposal sites. In Zimbabwe, the Ministry of Local Government Rural and Urban Development (MLGRUD 1995) mentioned that the major problem with collection is inappropriateness and shortages of vehicles for collection. In 1999, the Harare city council failed to collect refuse because only 7 out of its 90 trucks were operating, this was due to insufficient funds for training personnel and equipment maintenance (UNCHS, 2001).

2.8 Environmental problems associated with solid waste

Inappropriate solid waste disposal is a major threat to the environments of developing countries since most of the solid waste generated in developing countries end up directly in open dumps which are uncontrolled and overloaded (Bandara and Hettiarachchi, 2003). Air pollution from landfill emissions, ground water pollution from leachates as well as decreasing the aesthetic value of an area are some of the associated environmental problems with solid waste.

Emissions of landfill gas and leachate are released into the environment causing severe pollution problems. Leachate produced from decomposing waste percolate into the soil and contaminate surface and groundwater sources (Manyanhire *et al.*, 2009). Methane released into the atmosphere through anaerobic degradation of waste material in open dumps is a significant contribution to green house gases. According to Bandara and Hettiarachchi (2013), in the global scale, about 8% of the green house gases released to the atmosphere come from landfills. From an environmental perspective green house gases emissions are an emerging concern of Municipal solid waste management, as it is estimated to account for almost 5% (1,460 tonnes of carbon dioxide equivalent) of total green house gas emissions, (Hoornweg *et al.*, 2013). Another

environmental problem that can be associated with waste is that of air pollution in the form of odours arising from the degradation of waste materials.

Dumpsites pose health problems because of their attraction of mosquitoes, rats, cockroaches and flies leading to malaria and cholera outbreaks (Masundire and Saunyanga, 1999). They also alter the edaphic and aquatic environments whose geographical extent is difficult to determine (Masocha, 2001). According to Greenberg (1971) and Prikford (1983) both houseflies and mosquitoes fly a distance of up to 5 kilometers. These can be effective carriers of sanitation related diseases such as cholera and malaria to residents who lie within 5 kilometers from the waste dumps.

Waste also destroys the aesthetic value of a place thereby reducing its attractiveness. This could have a negative impact on the tourism industry which heavily depends on the natural environment for its success.

2.9 Knowledge gap

Not much literature is available for solid waste management practices in rural communities globally, let alone in Zimbabwe. Most researches that have been conducted in Zimbabwe concentrated on waste management issues in the major urban centres of the country, for example Harare, Gweru, Mutare and Victoria Falls. Not much is known and very little has been documented on the solid waste management practices in rural areas even at a global scale. This research project aims at shedding light on the solid waste management practices at a growth point so as to bring rural areas on the spotlight. Much reference will be given to solid waste management practices in urban areas so as to allow conclusion to be drawn for rural areas.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology employed in this research. It focuses on the research design, research instruments, data collection tools, sampling procedures, data analysis and presentation procedures used in relation to solid waste management at Mubaira growth point.

3.2 Research Design

Research methodology is the systematic, theoretical analysis of methods applied to a field of study or the theoretical analysis of the body of methods and principles associated with a branch of knowledge. It encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques (Irny and Rose, 2005).

In this research, both qualitative and quantitative research designs were used. Qualitative analysis is an umbrella term for a broad range of different approaches and methods which vary considerably in terms of focus, assumptions about the nature of knowledge and the role of the researcher (Mason, 2002). The researcher used qualitative approach which is considered warm because it is in great part concerned with human beings, that is interpersonal relationships, personal values, meanings, beliefs, thoughts and feelings. The qualitative researcher attempts to attain rich, deep and valid data and hence, from a rational point of view, the approach is inductive. According to Patton (2002), qualitative researches permit the evaluator to study selected issues, cases or events in depth and detail. In qualitative research, the interviewer is an integral part of the investigation. Qualitative research was used so as to get in-depth information on issues to do with solid waste management at Mubaira growth point so as to see whether or not the system was effective. The qualitative techniques used in this research include closed as well as open-ended questionnaires, interviews and observations.

In quantitative research, the aim is to determine the relationship between an independent variable and a dependent variable (Wolcott, 2005). Quantitative approaches allow for large-scale measurement of ideas, beliefs and attitudes. They manipulate variables and control natural phenomena and are used to describe, test relationships and examine cause and effect relationships. It attempts to gather data by objective methods to provide information about

relations, comparisons and predictions and attempts to remove the investigator from the investigation (Smith, 1983). The pros of using quantitative analysis is that generally, quantitative methods are designed to provide summaries of data that support generalisations about the phenomenon under study. In order to accomplish this, quantitative research usually involves few variables in many cases and employs prescribed procedures to ensure validity and reliability. In this research, quantitative approach was used using closed-ended questionnaires so as to investigate whether or not the waste collection service is managing to clear all produced waste at a time.

3.3 Sampling Procedures

Sampling is the process of selecting units (for example people, organisations) from a population of interest so that by studying the sample we may fairly generalise our results back to the population from which they were chosen (Trochim, 2006). A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster, 1985). The goal of sampling is to obtain an unbiased (representative) sample of the target population (Jensen, 2005). In this research, probability sampling was used because it uses a random selection method to set up a process or procedures that assure the different units in the target population have equal probabilities of being selected (Jensen, 2005). This eliminates bias and in so doing allows the researcher to calculate each unit's probability of inclusion, determine errors and make inferences or common conclusions about the target population as a whole.

Mubaira growth point is made up of household units and business premises. In order for the researcher to carry out the research effectively and to avoid any bias in sampling, the researcher used stratified sampling. Stratified sampling is implemented when the researcher knows that the population contains sub-populations and he/she samples within each of these (Jensen, 2005). Stratified-systematic sampling was used to determine the sample for household units, using a rule of 5-household intervals up to the required sample size. The researcher also used purposive sampling in determining the sample for business premises at Mubaira growth point. The researcher used her judgement to select a sample she believed was representative of the target population, so that objectivity (or the lack of it) becomes a critical issue since the large bias can be introduced if a researcher's preconceptions about the target population are inaccurate and/or are at the heart of the selection process (Jensen, 2005).

The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample (Barlett et al., 2001). As the population in the study was divided into two sub-groups, that is household and business premises, the researcher came up with two sample sizes. For the household group, the target population had about 400 households. This group was more homogeneous in nature so the researcher decided to use 20% of the target population as sample size which gives a total of 80 household units. For the business premises group, the researcher decided to use 50% of the target population which had about 40 business units, due to the heterogeneous properties of the group or degree of variability giving a total of 20 business premise units. Generally, the greater the variability in the population, the larger the sample size needs to be so that all of the variability is measured (Agresti and Finlay 2009; IFAS 2008).

3.4 Target population

The target area of the research was Mubaira growth point. The target population were the residents as well as the business persons of Mubaira growth point as the study was concentrating on the solid waste management at their households and business premises. Staff members at Chegutu Rural District Council were also part of the targeted key informants for interviews as they had information on the solid waste management system at Mubaira as they are the service providers. An EMA officer was also targeted as a key informant as he had the knowledge on the particular study being carried out.

3.5 Methods of data collection

The researcher used both primary and secondary data tools in collecting data for the study. Primary data is data collected from first-hand experience and has not been published yet and is more dependable, authentic and objective (Churchill, 1995). The primary data sources that were used include questionnaire surveys with structured and semi-structured as well as open-ended questions, interviews and field observations.

3.5.1.1 Primary data sources

3.5.1.2 Questionnaire surveys

A questionnaire is a means of eliciting the feelings, beliefs, experiences, perceptions or attitudes of some sample of individuals (Key 1997). The questionnaires were directed at the residents as well as business persons (including employees) of Mubaira growth point. Open-ended and closed-ended questions were used so as to gather as much information as possible on solid waste generation and management at Mubaira. The questionnaires were targeting these two sub groups as they are the major groups that produce solid waste at Mubaira and would be very much aware of the solid waste management system in place. The questionnaires were self-administered by the researcher to the selected sample size. The information that was gathered included the types of solid waste produced, management of the solid waste at household and/ or business premises levels, the solid waste management system's efficiency, and solid waste management at community level as well as practices of solid waste recycling and reducing. The respondents were also asked to give their opinions on what they thought should be done to improve the solid waste management system in place. The questionnaires were administered in a space of two weeks between 8 am and 4pm every day. A total of eighty houses and twenty business premises were given the questionnaires. The eighty houses were chosen through stratified sampling with a systematic internal of five households. The twenty business premises were chosen using purpose sampling due to the heterogeneous properties of the population. The researcher picked the twenty business premises she felt would represent the whole population

3.5.1.3 Interviews

An interview is a direct face to face attempt to obtain reliable and valid measures in the form of verbal responses from or more respondents (key 97). The purpose of research interview is to explore the opinions, experiences, beliefs and / or inspirations of individuals on specific matters. Qualitative methods, such as interviews are believed to provide a 'deeper' understanding of social phenomena that would be obtained from purely quantitative methods such as questionnaires (Silverman, 2000). In this research, interviews were conducted with members of the executive at Chegutu Rural District Council that is, the Environmental Officer, Social Services Officer, Treasurer, Human Resources and Administration Officer and the Roads, Works

and Planning Officer. These were key informants as far as the solid waste management system at Mubaira was concerned. An external officer from the Environmental Management Agency (EMA) was also interviewed on the same subject as he was responsible for environmental issues in the whole Chegutu District. The structure of the interview guides was such that specific information about the solid waste management system in place at Mubaira would be gathered at maximum. Respondents were also asked to give their personal views concerning the topic under study so as for the researcher to capture even the data that was not included on the interview guides. Unclear interview questions as well as answers were clarified during the course of the interviews so as to gather correct information that the researcher was targeting. Interviews allow the researcher to clarify ambiguous answers and when appropriate, seek follow-up information (Leedy and Ormrod, 2001).

Table 3.01: key informants and the rationale for the interview

Organisation	Department	Designation	Reasons for interview
Chegutu RDC	Agriculture and environmental management	Environmental Officer	He is the head of the environmental management department and has the knowhow on the solid waste management system in place and how it is functioning, the challenges being faced in keeping it functioning. He also drafts the annual working papers budget for the environmental management department
Chegutu RDC	Finance	Treasurer	She is the head of the finance department, responsible for managing and dispatching financial resources for the different programmes undertaken by council. She also had the

			knowhow on the charges that council is charging for waste collection and management at Mubaira
Chegutu RDC	Administration	Human Resources and Administration Officer	He is responsible for the smooth running of all departments and is aware of the programmes being undertaken by council. He is aware of council's budget and financial allocations
Chegutu RDC	Roads, Works and Planning	Planning officer	Responsible for planning at Mubairagrowth point and has the knowhow on the solid waste management system especially the location of the dumpsite
EMA	Environmental Management and protection	District Environmental Officer	Responsible for environmental issues in the district, including Mubaira also knows the approved methods of solid waste management and disposal
Chegutu RDC	Social Services	Social services officer	He is in touch with the social needs of the people in all areas under Chegutu Rural District Council's jurisdiction, in charge of all projects to do with the social needs and services of the people

3.5.1.4 Observations

Observation entails the systematic noting and recording of procedures, behaviours and artefacts (objects) in the social setting chosen for study. Observational research findings are usually flexible and do not necessarily need to be structured around a hypothesis (Kumar, 1999). Observations involve more than “just hanging out”, planful and self-aware observers use observation systematically, (DeWalt and DeWalt, 2001). The researcher used field observations because there was no need for contact or altering of the environment of study as the researcher was just watching the subjects in their usual environment.

The researcher used a checklist to observe the evidence of refuse bins, illegal dumps or dumping of waste, types of solid waste generated, waste management strategies in place, separation of waste at source, collection points, burning of waste as well as council vehicles used for waste collection. The observations were carried out at Mubaira growth point. The researcher was observing all these elements so as to gather information on what exactly was happening on the ground as far as solid waste management was concerned at Mubaira not relying on reported data. This was important for data compilation as well as complementing data gathered from interviews and questionnaires. The researcher moved around Mubaira growth point on foot observing phenomena using her checklist. The researcher also captured some images using a camera during the observations to complement her observations.

3.5.1.5 Focus group discussions

A focus group discussion is a group discussion on a particular topic organised for research purposes. This discussion is guided, monitored and recorded by the researcher (sometimes called a moderator or facilitator), (Morgan, 1998). The researcher used focus group discussions to generate information on collective views as well as the meanings behind those views. They are useful in generating a rich understanding of participants’ experiences and beliefs, (Morgan, 1998). The researcher used a focus group discussion of 10 members from different business premises as well as households. The researcher purposively picked these members so they could represent the views of the larger population. The researcher used a guide with questions that were communicated to the group for discussion. The guide intended to gather information on the solid waste management system at Mubaira, its frequency and effectiveness, how solid waste is disposed of at household /business premises level as well as their views on how they felt solid

waste should be managed and what Chegutu Rural District Council should improve on in its solid waste management system. This was done to clarify, extend, qualify and challenge data collected through other methods. The researcher recorded the responses as the discussion progressed.

3.5.1.6 Secondary data sources

The researcher also used secondary data sources to gather relevant data in this research. Secondary data was obtained from company documents that had to do with solid waste management. Unfortunately, the only copy of the company by-laws could not be located for the researcher to use. Documents on the internet gave the researcher some information on solid waste management, how it is generated and managed at global, regional and local levels. Data from EMA was also used as it also deals with issues to do with proper solid waste management for healthy and friendly environments.

3.6 Data Analysis

After the researcher had finished collecting data in the field, the researcher compiled all the data obtained from questionnaires, interviews, observations, focus group discussions as well as field measurements for presentation. Tables, graphs and charts were used to present statistical data. Direct observations were complimented by the research notes which were taken down during observations and these were analysed in form of descriptions and photograph analysis. Data was analysed by making comparisons of all data collected so as to meet the objectives of the research.

3.7 Limitations and ethical considerations

For the researcher to carry out the study efficiently and effectively, she had to consider and respect the ethics of the targeted population. Knowing that Mubaira is a rural setup and most of the residents have a rural background, the researcher had to be careful in the way she approached the respondents so as not to offend them in any way thereby compromising the effectiveness of the research. The targeted respondents also were elderly people and hence the dress code of the researcher had to be appropriate so as to create a comfortable environment between the respondent and the researcher. The researcher had to make it clear and promise on

the confidentiality of the information that the respondents were going to give so that the respondents would give detailed responses without fear of being exposed.

The questionnaires were administered in a rural setup and a large proportion of the target population had difficulty in understanding the context of the questions being asked and this resulted in the respondents answering according to their own understanding. This resulted in the researcher obtaining in some cases information that did not correspond with the questions being asked. The questionnaires were administered between 0800hrs and 1600hrs and most of the respondents were busy by the time the researcher reached them and some had already gone for work.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter provides an outline of the research findings of this study. The results are presented in the form of charts, graphs, photographs as well as tables. Inferential statistics in the form of chi-square tests are also employed to test for significance.

4.2 Demographic characteristics of respondents

In this research, a total of 120 questionnaires were administered in a bid to try and ascertain the solid waste management practices in place in Mubaira. The questionnaires were meant to source information on waste generation, storage, collection and disposal in Mubaira. These questionnaires were administered to two target populations namely the households/residential respondents and the business premises respondents. Of the 120 questionnaires, 80 were administered in the households target population whilst 40 were for the business premises respondents. However, of the 80 questionnaires distributed in the households target population, only 70 had been answered, whilst in the business premise target population 30 had been answered, giving a total of 100 answered questionnaires. The response rate for the target population in whole was around 80%. The socio-demographic data of the respondents obtained for the residential/ households respondents include age, gender, education levels, household size, occupation and length of residence in Mubaira, whilst for the business premise respondents it included age, gender, education levels as well as occupation.

Figures 4.11 and **4.12** show the proportion of females to males who participated in the questionnaire survey carried out in Mubaira. Both women and men participated in the questionnaire filling at both household and business premise levels. The proportion of females to males in the households population was 51.4% to 48.6% respectively whilst in the business premise it was 46.7% females to 53.3% males. This shows that in the households target population, many respondents were females, a factor which could be attributed to the fact that most women in the rural areas of Zimbabwe spend most of their times at home because they are unemployed or self employed. The margin of difference between males and females however was not very large which could be because most males in rural settings are not formally employed. The case was a bit different in the business premise target population as more males

were recorded than their female counterparts, also females held less important positions at work. This could have been because in rural settings, males are the ones who are expected to work and fend for their families whilst women stay behind and take care of the children and household chores. Females who go job seeking as their male counterparts are often stereotyped by society as prostitutes.

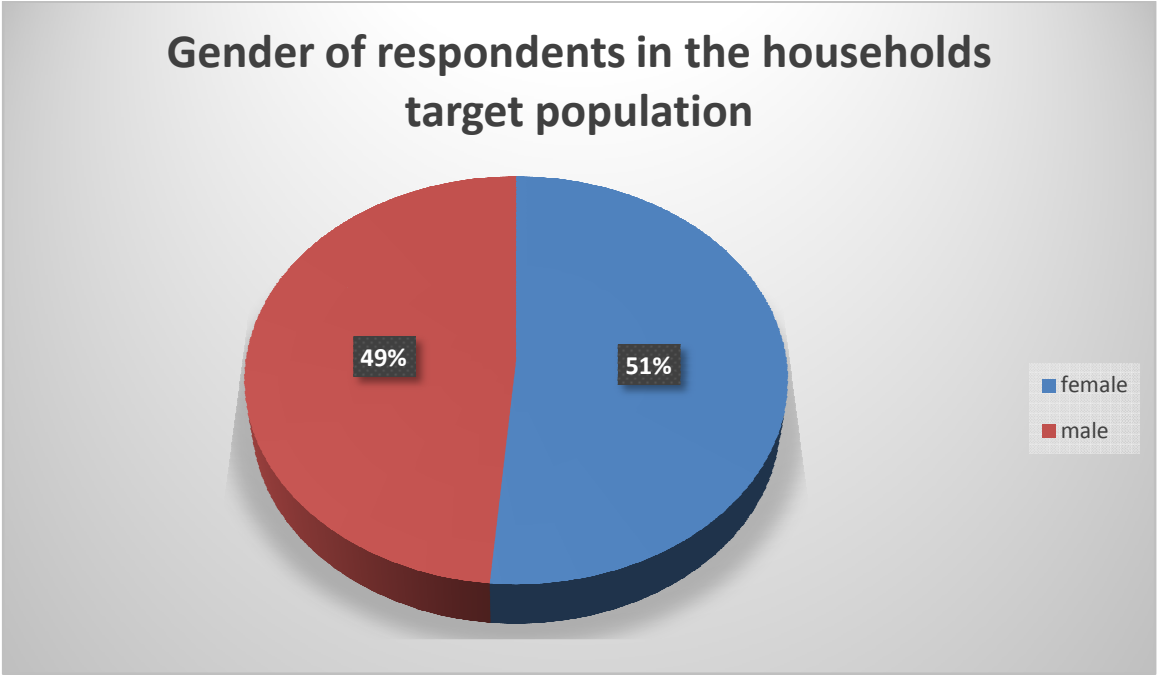


Fig 4.11 Gender of respondents in the households target population

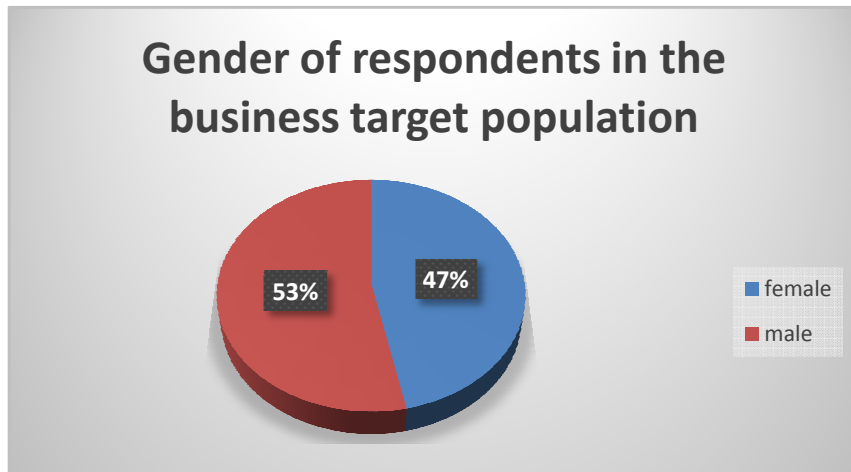


Fig 4.12 Gender of respondents in the business target population

Information on the occupation status of the respondents is as follows, for the households target population about 43% of the respondents were not formally employed, with about 17% unemployed whilst in business premises respondents, all respondents were formally employed, with more males than females. From the households target population, of the formally employed, 14.3 % were females, whilst 23.7% were males, of the informally employed half were females whilst 1.4% were males. Occupation status information helped the researcher to link the types of waste produced with the type of occupation of the respondents. **Figs 4.13** and **4.14** show the occupation status of the respondents.

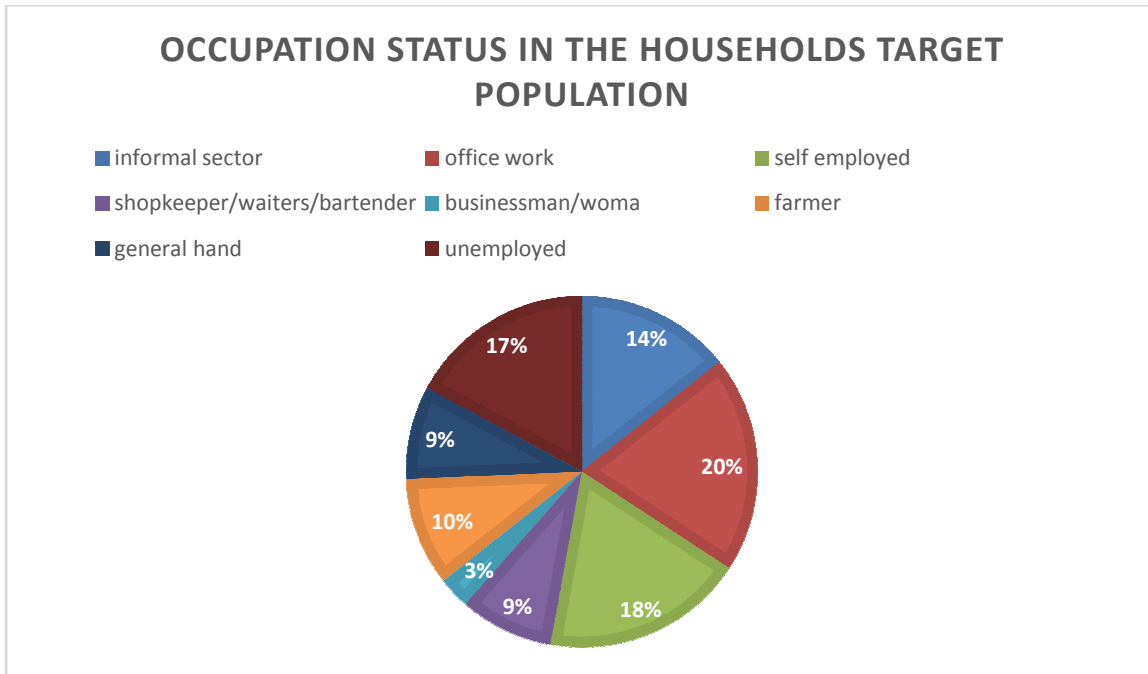


Fig 4.13 Occupation status in the households target population

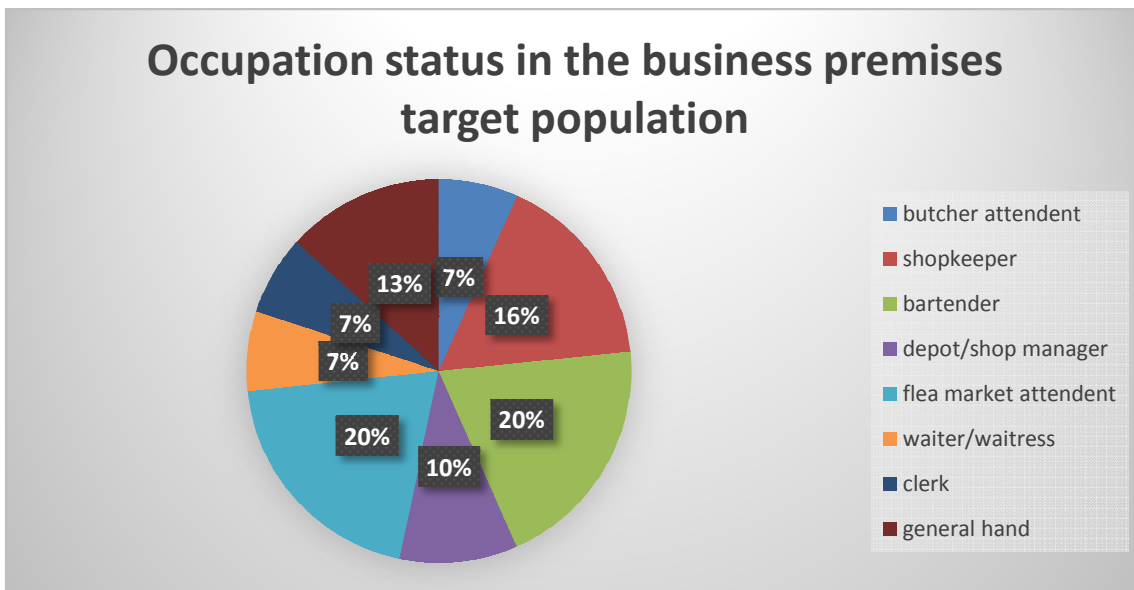


Fig 4.14 Occupation status of the business premise target population

A summary of the age distribution of respondents is illustrated in **Figs 4.15** and **4.16**. According to **Table 4.1**, of the 70 respondents in the household target population, 34,3 % represented the

group which fell between the 21-30 years,35.7% for those between 31-40 years, the 41-50 years as well as 51-60 years age groups were represented by 17.1% and 5.7% respectively. The 60+ age group was represented by 7.1%. For the business premise respondents in **Table 4.2**, the 21-30 years age group was represented by 40%, the 31-40 years age group with 43.3% whilst 16.7% represented the 41-50 years age group.

Table 4.1 Age distribution of the households target population

Age of respondents

Age (years)	Frequency	Percent	Valid Percent	Cumulative Percent
21-30	24	34.3	34.3	34.3
31-40	25	35.7	35.7	70.0
41-50	12	17.1	17.1	87.1
51-60	4	5.7	5.7	92.9
60+	5	7.1	7.1	100.0
Total	70	100.0	100.0	

Source: Field survey (2014)

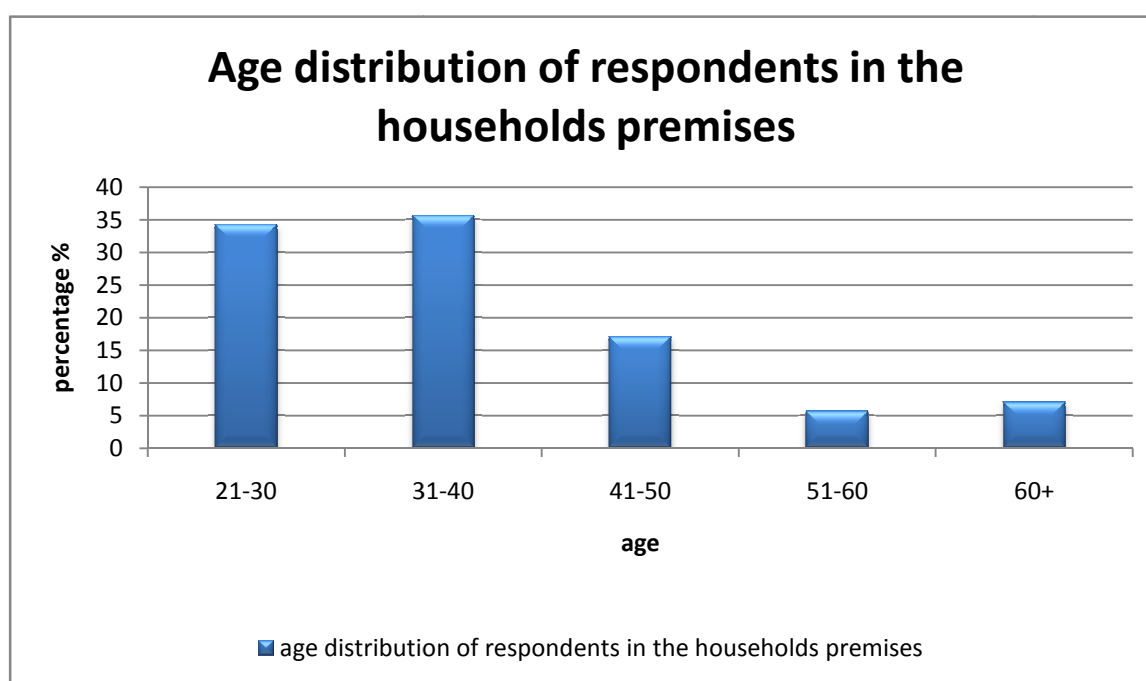


Fig 4.15 Age distribution of households respondents

Table 4.2 Age of respondents of the business premise target population

Age of respondents

Age(years)	Frequency	Percent	Valid Percent	Cumulative Percent
21-30	12	40.0	40.0	40.0
31-40	13	43.3	43.3	83.3
41-50	5	16.7	16.7	100.0
Total	30	100.0	100.0	

Source: Field survey (2014)

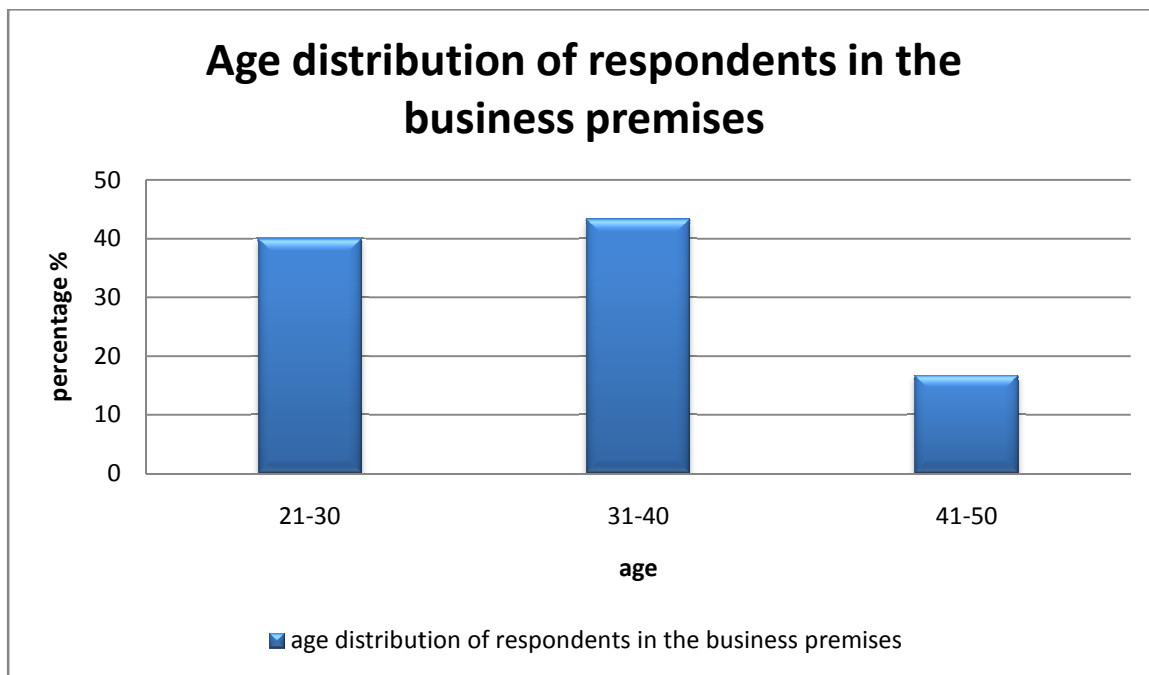


Fig 4.16 Age distribution of respondents in the business premises target population

Data on the educational attainments of the respondents is presented in the form of charts below. For the households respondents, 20% had attained grade 7 as their highest level of education, 44.3 had Ordinary level, 14.3% had Advanced level, another 14.3% had a diploma whilst degree holders and post graduates were represented by 5.7% and 1.4% respectively. This distribution explains why of the 70 respondents, 60% were not formally employed because they do not have enough qualifications to enable them to be formally employed in Mubaira or better still move to

bigger cities for employment. For the business premise respondents, 60% had Ordinary level as their highest level of education whilst 20% had Advanced level, 16.7% were Diploma holders whilst only 3.3% were Degree holders.

A look at the household size distribution from the household respondents shows that most respondents had more than 5 people residing at their houses. The total percentage of those with more than 5 people being 61.4% as compared to 38.6% of those with less than 5 people. This was because most houses were multi-family residents, meaning more than one families were resident at the same house.

Figure 4.17 illustrates the information on the length of residence in Mubaira of the household respondents. Of the 70 respondents, 74.3% had more than 6 years of residence in Mubaira, the remaining 25.7% had been living in Mubaira for less than 5 years. This information was important for this research as most of the respondents would be in a position to even refer back in time on the topic of discussion. Those who have been staying in Mubaira for much longer would be in a better position to know exactly how things are and how they had been going in the past. This is important in assessing the effectiveness of the waste management system.

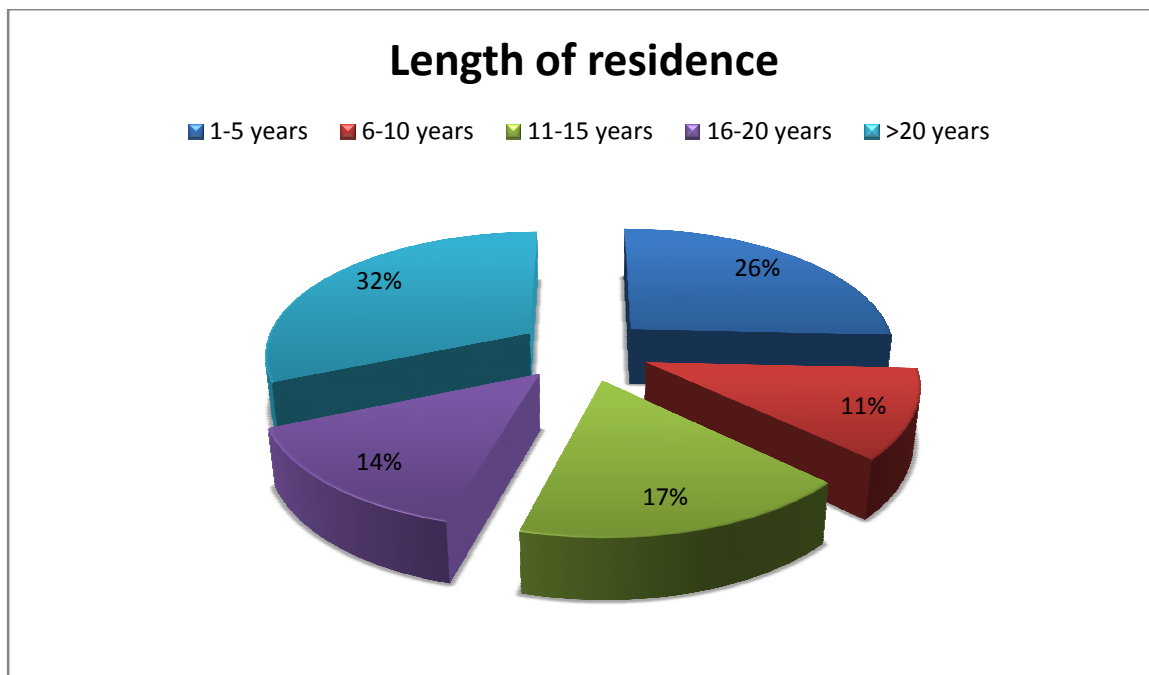


Fig 4.17 Length of residence for the households respondents

4.3 Waste Characterization in Mubaira

4.31 Types and amounts of waste generated

The solid waste survey from Mubaira was derived from 2 target populations that is the households as well as the business premises. The solid wastes can be divided into two broad categories namely biodegradable (organic) and non-biodegradable (inorganic) waste. Biodegradable wastes are those types of waste that can be broken down by micro-organisms and other living things in a reasonable amount of time. Non-biodegradable waste refers to waste which cannot be easily broken down by other living organism. **Table 4.3** shows the types of waste reported by respondents to be the most common types of waste they produce daily in Mubaira.

Table 4.3 Types of waste in the households target population

Type of waste	Specific types	Percentage
<u>Organic</u>		
➤ Food waste	Sadza/rice, vegetables, rotten fruits and fruit peels	40
➤ Garden waste	Leaves, rotten plants, weeds	10
<u>Inorganic</u>		
➤ Paper	cardboard box, newspaper old books	17.1
➤ Plastic	plastic bags, food packages, plastic bottles and containers dust	28.6
➤ sweep waste	leaves, blown papers ,plastics	2.9
➤ Yard waste	etc	1.4

Source: Field survey (2014)

According to **Table 4.3**, it can be noted that the total amount of organic waste recorded in the households target population was half the amount of the total waste recorded. This was probably because the survey was conducted during neutral times as far as waste production was concerned, meaning the survey was conducted mid-year when consumption levels will be low as compared to the end and beginning of the year. This was gathered during a focus group discussion that was conducted during the survey. During this period of the year, more people will be in Mubaira for the festive holidays unlike any other time of the year. Mubaira growth point being a rural setting, consumption patterns are influenced by seasons, hence waste production is also influenced by seasons. More waste in terms of quantity as well as complexity can be noted during the festive season according to the focus group discussion. **Table 4.4** shows the types of waste gathered from the business premises respondents.

Table 4.4 Solid waste types from the business premises target population

Type of waste	Specific types	Percentage
<u>Organic</u>		
➤ Food waste	Sadza/rice, vegetables, rotten fruit and fruit peels	8
<u>Inorganic</u>		
➤ Plastics	Packaging plastics, empty containers	18.7
➤ Paper	Packaging paper, newspapers, cardboard box	20
➤ Bottles/glass	Broken empty bottles, water glasses, dinner plates	13.3
➤ Kaylites	Packaging material	6.7
➤ Sweep waste	Dust, plastics, papers, bottles etc	33.3

Source: Field survey (2014)

According to **Table 4.4**, it can be noted that inorganic waste constitutes the larger proportion of 92% whilst organic waste constituted only 8% which was from food waste. This ratio could be because there are differences in the types of business activities that are carried out at Mubaira.

Organic waste which constitutes mainly of food stuffs from take-aways and food outlets held the lesser proportion because the producers of such waste are fewer than those who produce inorganic wastes like papers and plastics. Business premises like bottle stores, butcheries, supermarkets as well as grocery shops rarely produce organic wastes contributing to the larger proportion of inorganic wastes in the business premise target population.

Biodegradable waste from both households and business premises were similar in nature, with items which included food scraps comprising of sadza, vegetables and fruit peels. From the business premises respondents, inorganic waste recorded included plastics, paper, glass/bottles, as well as kaylites. From the households respondents, waste included plastics and papers. During the survey, observations were also used as a data collection tool. From the observations carried out, other types of solid waste were noted which are presented in Table 4.5.

Table 4.5 Solid waste types observed during the field survey

Type of waste	Category	Source
Diapers	Inorganic	Households premises
Wood	Organic	Households and business premises
Bones	Inorganic	Households and business premises
Metal(scrap)	Inorganic	Business premises
Tin cans	Inorganic	Households and business premises
Rubber/tyres	Inorganic	Business premises
Textiles	Organic	Households premises
Food wrappers(sweets, biscuits, potato chips etc)	Inorganic	Households and business premises

Source: Field survey (2014)

Table 4.5 shows the waste types that were observed during the survey. These waste types were not mentioned by the respondents. This was probably because these types of wastes are common during a specific time period which could be during the festive season where most people will be in a position to spend more money on luxurious goods and food stuffs. It can be noted that of these wastes, most items are inorganic in nature, meaning they cannot be broken down easily by

other living organisms. Solid waste characterization was done through hand sorting as well as visual characterization by the researcher at both household and business premise levels.

Results from the questionnaire survey for the households target population as well as the focus group discussion managed to bring out the common types of solid waste that are produced in Mubaira regularly. The researcher managed to observe the types of solid waste in the waste stream so as to compare results with those from the surveys. Waste that has been recorded to be common in households include food scraps which included sadza, rice, vegetables and fruits, plastics, papers, garden waste, household and yard sweepings, bones, textiles as well as diapers.

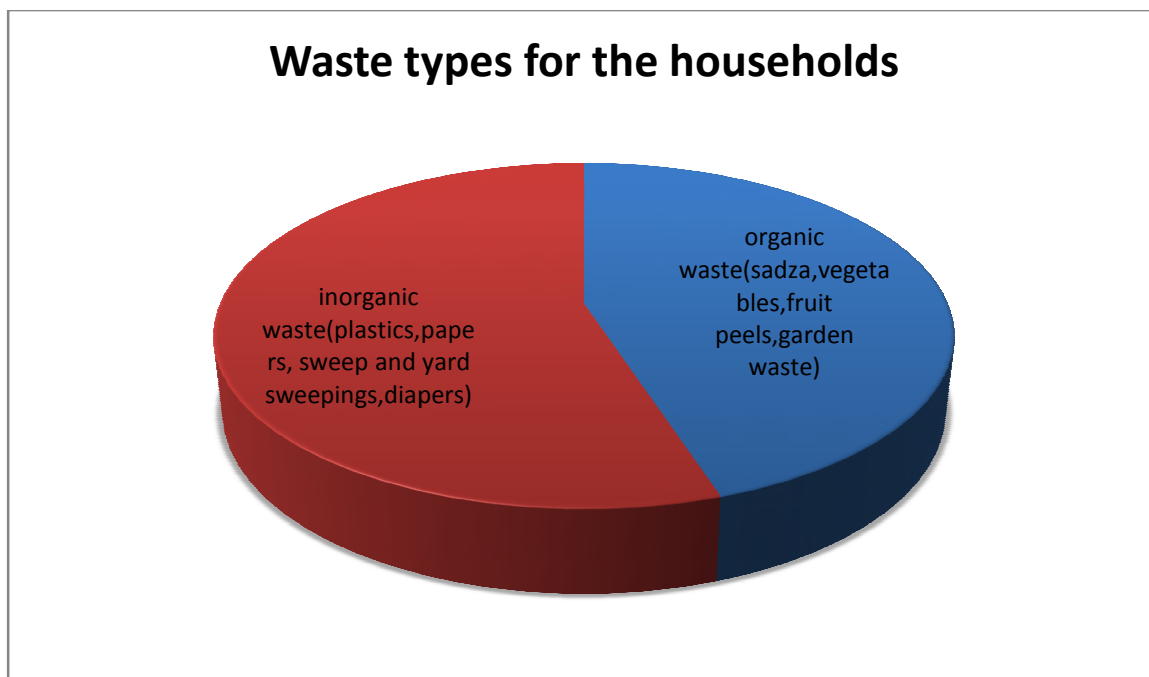


Fig 4.18 Organic and inorganic wastes for the households target population

A look at the questionnaire responses from the business premises respondents showed that most types of solid waste common to households were also common in the business premises. Additional waste found in the business premises includes broken glass/bottles, kaylites, wood, rubber/old tires as well as tin cans. From the households target population, organic waste constituted almost half of the total waste, whilst inorganic waste covered the larger proportion with more items including plastics and papers. This however was not the case for materials found in the business premises as only 8% of the material was organic, the remaining 92% being inorganic waste with items that include sweep waste, plastics, papers and bottles/glass.

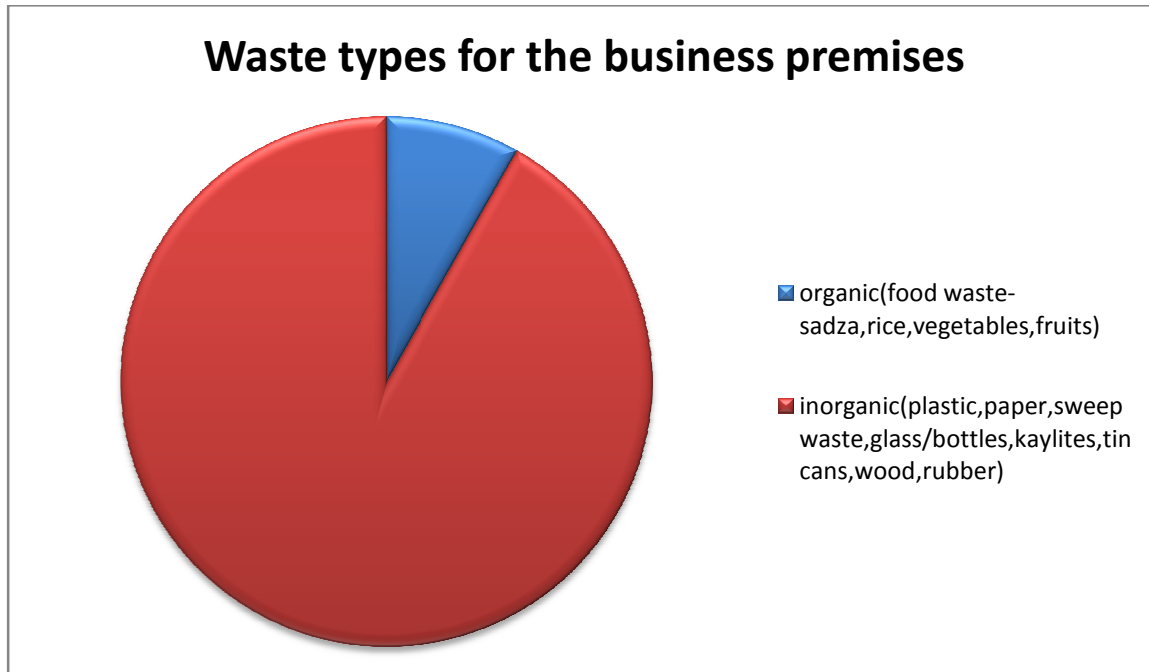


Fig 4.19 Organic and inorganic wastes for the business premise target population

The types of wastes indicated above do not represent all types of solid wastes common in Mubaira, but rather the types common the time during which the survey was carried out. In some cases solid waste production is influenced by seasons. Solid waste in Mubaira can be differentiated by seasons according to the focus group discussion survey carried out. Solid waste types common during the mid-year period are different from wastes common during the festive season that is Christmas and New year holidays. More complex and diverse types of solid waste can be noted during the festive season probably because this is the time of the year when people do spend a lot even on luxurious items that they do not get during the rest of the year. It was also gathered from the group discussion that more money is also spent on edibles, including foods that are not normally consumed any other times of the year, for example, food snacks like biscuits, ice-creams, potato chips, yoghurts etc. This is also the period when garden fresh produce is consumed like fresh mealies. This is also the time when most people are on holidays, even those in the diaspora visit home. These visits home involve meeting and gathering as family, eating and drinking. The festive season is also usually graced by numerous parties and celebrations which involve consumption of a variety of edibles. All this information gathered from the focus group discussion increases the amount as well as types of solid waste mainly from various food varieties and such is the case in Mubaira. As a way of trying to validate this, a

hypothesis test was carried out to determine the association between waste types and seasonality. This test was carried out to determine whether the types of solid waste differ according to seasons. The results of this hypothesis are presented below.

4.3 1 2 a) Hypothesis 1: On waste types and seasons in the households target population

H₀= there is no association between waste types and seasonality

H₁= there is an association between waste types and seasonality

The formula for calculating Chi-square test is:

$$X^2 = \frac{(O - E)^2}{E}$$

Where: **O** is the Observed Frequency in each category

E is the Expected Frequency in the corresponding category

X² is Chi Square

Table 4.6 Responses from the household target population

Season/ Period	Responses
Nov-Jan	42
Feb-April	4
May-July	17
Aug-Oct	7

Source: Field survey (2014)

Table 4.7 Association between waste types and seasonality results (households)

Season/ Period	Observed(O)	Expected (E)	$\frac{(O - E)^2}{E}$
Nov-Jan	42	17.5	34.3
Feb-April	4	17.5	10.4
May-July	17	17.5	0.01
Aug-Oct	7	17.5	6.3
			Σ= 51.01

Chi-square X²=51.01

Degrees of freedom (df)= n-1

$$= 4-1$$

$$df = 3$$

Using 5% as the margin of error, the critical value was 7.82. When the X^2 value is greater than the critical value, we accept H_1 and reject H_0 . In this case therefore we conclude that there is an association between waste types and seasonality for the households respondents.

b) Hypothesis 2: On waste types and seasonality for the business premise target population

H_0 - There is no association between waste types and seasonality

H_1 - There is an association between waste types and seasonality

Table 4.8 Responses from the business premise target population

Season/ Period	Responses
Nov-Jan	13
Feb-April	3
May-July	6
Aug-Oct	8

Source: Field survey (2014)

Table 4.9 Association between waste types and seasonality results (business premises)

Season/ Period	Observed (O)	Expected (E)	$\frac{(O - E)^2}{E}$
Nov-Jan	13	7.5	4.0
Feb-April	3	7.5	2.7
May-July	6	7.5	0.3
Aug-Oct	8	7.5	0.03
			$\Sigma = 7.03$

Chi-test $X^2 = 7.03$

Degrees of freedom (df) = n-1

$$= 4-1$$

$$df = 3$$

The critical value using 5% as the margin of error is 7.82. If the χ^2 is greater than the critical value, we reject H_0 and accept H_1 . In this case, the χ^2 value is smaller than the critical value hence we reject H_1 and accept H_0 , meaning that in this case, there is no association between waste types and seasonality for the business premises. This is so because for the business premises, normal business takes place even during the festive season and holidays, only a marked increase in the returns is recorded. The goods that they trade in during the course of the year are the same goods that they will be trading in during the festive season and end of year holidays. This then means that there is no change in the type of solid waste that they produce, hence the results of the test showing that there is no association between waste types and seasonality for the business premise target population.

Apart from the waste types being produced in Mubaira residential areas, there is also the issue of waste amounts that are being produced. Mubaira being a growth point, most people would like to settle in the residential area around the growth point for access to communication lines, goods and services. This has resulted in multi-family households where more than one family reside at the same house. This has a direct input on the total amount of waste that is produced at such households. It was noted that houses that recorded large numbers of residents also recorded larger amounts of waste produced. To prove this point, a hypothesis test was carried out to determine whether there is an association between household size and the amount of waste produced in the household target population. The results of the test are presented below.

4.313 a) Hypothesis 3: On the relationship between household size and the amount of waste produced

H_0 - There is no significant association between household size and the amount of waste produced

H_1 - There is a significant association between household size and the amount of waste produced

The formula for calculating Chi-square test is:

$$X^2 = \frac{(O - E)^2}{E}$$

Where: **O** is the Observed Frequency in each category

E is the Expected Frequency in the corresponding category

X^2 is Chi Square

Table 4.10 Cross tabulation of the data on household size and the amount of waste produced by households respondents

Household size	Amount of waste produced weekly				Total
	< 1 bin	1 bin	2 bins	>2 bins	
1-5 people	13	11	3	0	27
6-10 people	10	15	7	0	32
11-15 people	0	4	3	1	8
>15 people	0	0	2	1	3
Total	23	30	15	2	70

Source: Field survey (2014)

The formula for calculating the Expected (**E**) value:

$$\text{Expected value (E)} = \frac{\text{row total} \times \text{column total}}{\text{Grand total}}$$

Table 4.11 Association between household size and amount of waste produced results

Observed (O)	Expected (E)	$\frac{(O - E)^2}{E}$
13	8.9	1.89
11	11.6	0.03
3	5.8	1.35
0	0.8	0.8
10	10.5	0.02
15	13.7	0.02

7	6.9	0,001
0	0.9	0.9
0	2.6	2.6
4	3.4	0.12
3	1.7	1.0
1	0.2	3.2
0	1.0	1.0
0	1.3	1.3
2	0.6	3.27
1	0.1	8.1
		$\Sigma = 25.7$

$$X^2 = 25.7$$

$$\begin{aligned} \text{Degrees of freedom (df)} &= (\text{number of rows}-1) (\text{number of columns}-1) \\ &= (4-1) (4-1) \end{aligned}$$

$$\text{df} = 9$$

5% was used as the margin error and the critical value was 16.92 which is less than the X^2 value. In such a case when the X^2 value is greater than the critical value, we reject H_0 and accept H_1 , meaning that from the test it can be deduced that there is a significant relationship between household size and the amount of waste produced. More people in a household produce more waste as compared to a household with less people, hence the result of this test.

4.4 Solid Waste Management Practices in Mubaira

Managing waste is a complex task that requires changes in consumption and waste production patterns, appropriate technology, organizational capacity and cooperation among a wide range of stakeholders (Zarate *et al.*, 2008). **Table 4.12** shows the various methods of waste disposal used by residents in Mubaira.

Table 4.12 Methods of waste disposal at households

Method of disposal at households

Method of disposal	Frequency	Percent	Valid Percent	Cumulative Percent
Open dumping	11	15.7	15.7	15.7
Pit	32	45.7	45.7	61.4
Bin	20	28.6	28.6	90.0
Burning	6	8.6	8.6	98.6
Burrying/compost	1	1.4	1.4	100.0
Total	70	100.0	100.0	

Source:Field survey (2014)

The results from the questionnaire survey showed that only 28.6% of the respondents from the households target population used bins for waste storage at household level, whilst 45.7% used pits, 15.7% open dumping, 8.6% burning and only 1.4% composting. This was so because most residents do not have bins to use for storage probably because they cannot afford them hence they resort to other methods of storage or disposal. It was also gathered that the most common waste disposal methods in Mubaira are pits which constituted 42.9%, open dumping at 35.7% and burning of waste at 21.4%. Of the proportion which had bins, most of these bins were sacks, broken buckets and tins, only a small proportion had bin liners, plastic and metal bins as those shown in **Plates 4.1** and **4.2** .



Plate 4.1: Waste bins in Mubaira



Plate 4.2: Bin liners used in Mubaira

Table 4.13 Methods of disposal for business premises target population

Method of disposal at premise

Method of disposal	Frequency	Percent	Valid Percent	Cumulative Percent
pit	11	36.7	36.7	36.7
bin	19	63.3	63.3	100.0
Total	30	100.0	100.0	

Source: Field survey (2014)

From the business premises target population, a larger proportion of 70% had bins for waste storage whilst the remaining 30% did not have bins. Of the total respondents for the business premises, 63.3% reported that they used bins whilst the remaining 36.7% used pits for waste storage. The variation in part could have been because of the different nature of business being run by the different premises.

Differences can be noted from the two tables in terms of waste storage practices. From the survey results, business premises recorded only two waste storage practices namely bins and pits whilst households recorded five practices. This difference could be because much more attention is paid to business premises even by the general public in terms of general outlook. This would obviously call for business owners to try and make their premises tidy and attractive for business. Business entities are also in a better position to buy waste bins unlike the general public who usually resort to use less expensive waste storage practices like pits and burning. Most residential households in Mubaira are multi-family residents and these are characterized by untidy yards as well as pits for waste storage due to the fact that more people reside at the same house. Proper solid waste management at most of these houses would be difficult due to the different attitudes of residents towards waste management.

The questionnaire survey also meant to find out whether there was reuse of waste after their first use. Quite a large proportion of respondents (over 60%) responded to be reusing items after their first use whilst the remaining proportion were not reusing. Reuse is a good waste management

strategy as it reduces the quantity of waste at generation points (Hoornweg and Bhada-Tata, 2012) thereby reducing waste management problems at household level. For the business premises population, less than 30% reused items after their first use, the remaining percentage did not reuse. The items that are mostly reused by household respondents are plastics and plastic containers whilst business premise respondents only reuse plastic bags and empty bottles. The concept of waste re-use has not been properly communicated to the public so as to bring out its importance in waste management. Waste re-use by the public is done without them knowing how sustainable it is in reducing and managing solid waste. Should Chegutu Rural District Council together with other stakeholders like EMA hold awareness campaigns to teach on the importance of such practices, waste management would become easier for both the service provider and the service users.

The use of illegal dumpsites for waste disposal is slowly becoming common in Mubaira with 31.4% of the household respondents reporting that they lived near illegal open dumpsites. This could be because council's waste collection system is somewhat erratic resulting in residence resorting to dumping waste at open spaces just to rid their houses of waste and possible health hazards. 33.3% of the respondents from business premises also reported to be situated near illegal dumpsites. This problem of illegal waste dumps is probably triggered by the fact that council is not collecting waste efficiently resulting in the accumulation of waste. This then leads residents to dispose of the waste illegally at illegal open dumps. This problem is likely to grow if council does not intervene quickly by regularly collecting waste so that no excess waste is thrown away or dumped illegally.

Waste separation is a necessary operation in the recovery of reusable and recyclable materials from municipal solid waste, (Tchobanoglou *et al.* 1993). Waste separation is still an uncommon topic even in urban areas with only a few practicing it. A lot of people are reluctant to separate waste at source as they feel that it is a waste of time. Some actually view waste separation as a service which should be given by waste collectors. Respondents were asked if they separated their waste at source and only a small but rather significant proportion of 20% of the respondents from the households target population reported that they separated their waste before disposal. From the survey it was gathered that waste separation was done without the knowledge of its importance in waste management. Some would separate their waste so as to use biodegradable

waste in compost heaps whilst others would separate waste so as to enable them to burn waste. Although only a small proportion are into waste separation, this could be a good starting point to educate and encourage the rest of the population on the importance of waste separation as it reduces the amount of waste at source. Residents may also be engaged in waste recycling which could turn into profit making projects.

4.4 1 Waste Collection

Chegutu Rural District Council is the responsible authority for solid waste management in Mubaira. A small proportion of residents in Mubaira own a bin as highlighted earlier, the majority use pits, burning and open dumping for disposing their waste at household level. Waste collection by the Rural District council was said to be done on a weekly basis according to council's timetable and waste is collected from communal collection points in the residential area, whilst in the business centre it is collected on a door to door basis. However, respondents reported that waste collection was erratic meaning that the services being offered by council in terms of solid waste management were poor. Most residents, (about 45%) were not even aware if there was a solid waste management system in place as there was no evidence of it. Residents who were aware complained that there was no door to door waste collection by council which results in too much waste piling up at households. Residents complained that it was laborious to carry waste from their houses to communal collection points. They actually argued that council should have a door to door waste collection programme. Most residents pointed out that they do not remember council ever collecting their waste resulting in them resorting to using pits, burning and open dumping. Waste collection at business premise level is done on a door to door basis but complaints were also recorded concerning the efficiency of the system. Chegutu Rural District Council does not have a refuse collection vehicle, rather they hire a lorry for collection. This altogether, points out to a poorly managed solid waste service by council. A hypothesis test was carried out from the research results so as to determine whether there is any difference between the level of service being offered by council in the households and business premises target populations. Results of this test are presented below.

4.412 a) Hypothesis 4: On level of services offered by council and spatial area in the households target population

H₀- There is no relationship between the level of services offered by council and spatial area

H₁- There is a relationship between the level of services offered by council and spatial area

The formula for calculating Chi-square test is:

$$X^2 = \frac{(O - E)^2}{E}$$

Where: **O** is the Observed Frequency in each category

E is the Expected Frequency in the corresponding category

X² is Chi Square

Table 4.14 Responses on the level of services offered by council by the household respondents

Question: Is the frequency of waste collection adequate

Response	Number of respondents
Agree strongly	0
Agree	7
Moderate	14
Disagree	16
Disagree strongly	33

Source: Field survey (2014)

Table 4.15 association between level of services offered and spatial area

Response	Observed (O)	Expected (E)	$\frac{(O - E)^2}{E}$
Agree strongly	0	14	14
Agree	7	14	3.5
Moderate	14	14	0
Disagree	16	14	0.3

Disagree strongly	33	14	25.8
			$\Sigma = 43.6$

Chi-test $X^2 = 43.6$

Degrees of freedom (df) = n-1

$$= 5-1$$

df = 4

The critical value, using 5% as the margin of error is 9.49. If the X^2 value is greater than the critical value, we accept H_1 and reject H_0 . Therefore, in this case there is an association between the level of services offered by council and the spatial area.

b) Hypothesis 5: On the level of services offered by council and spatial area for the business target population

Table 4.16 Responses on the level of service offered by council by the business premise respondents

Question: Is the frequency of waste collection adequate

Response	Observed (O)	Expected (E)	$\frac{(O - E)^2}{E}$
Agree strongly	0	6	6
Agree	2	6	2.7
Moderate	9	6	1.5
Disagree	13	6	8.2
Disagree strongly	6	6	0
			$\Sigma = 18.4$

Chi-test $X^2 = 18.4$

Degrees of freedom (df) = n-1

$$= 5-1$$

df = 4

Using 5% as the margin of error, the critical value is 9.49. The X^2 value is greater than the critical value, hence we accept H_1 and reject H_0 . There is an association between the level of services offered by council and the target population. The results of this survey are true that there is an association between the level of service offered by council and the target population. From the survey, it was gathered that waste collection by council in the business centre is done on a door to door basis unlike in the households where waste is collected from communal collection points. This shows that, although the residential areas and the business centre are both receiving waste collection service from council, council chooses to give door to door services to the business community and not the residential areas for reasons better known to it.

The Human Resources officer at Chegutu Rural District Council indicated that the waste management system was being re-enforced beginning year 2014 after a long period of being dysfunctional. Chegutu Rural District Council admitted to facing a number of challenges in trying to setup the solid waste management system. In an interview with the treasurer at Chegutu Rural District Council, she pointed out that residents or rate payers are reluctant to pay taxes for waste collection services which is making it difficult for council to manage. Another challenge pointed out by the Environmental officer which council is facing is that residents are not willing to take their waste to strategically placed communal collection points. This results in waste piling up at households ultimately resulting in residents burning and dumping waste illegally. The planning officer for Chegutu Rural District Council also indicated that they were faced with financial problems which were making it difficult for them to have a fully fledged refuse collection system with proper equipment including a refuse compactor and well trained personnel, with the capacity to provide bins to the public as well as managing council's dumpsite. All these problems were pointed out by council employees in trying to explain the flaws in the solid waste management system in place in Mubaira.

Asked on whom they were willing to pay for the services of waste collection and disposal, 70% of the households respondents gave back responsibility to Chegutu Rural District Council as they felt it was the responsible authority and hence it should be the one to manage their waste. The other 30% was distributed among those who wanted government, private companies, Non-governmental Organizations, individuals or communities to manage their waste. From the business premise respondents, 81% responded in favor of council giving reasons that it was the

one which they were already paying for the service. This shows that although council has been having difficulties in effectively managing waste in Mubaira, service users still had confidence that council would actually manage to fulfill its task as it was the responsible authority. **Figs 4.20** and **4.21** shows the respondents' views on whom they were willing to pay for waste collection services

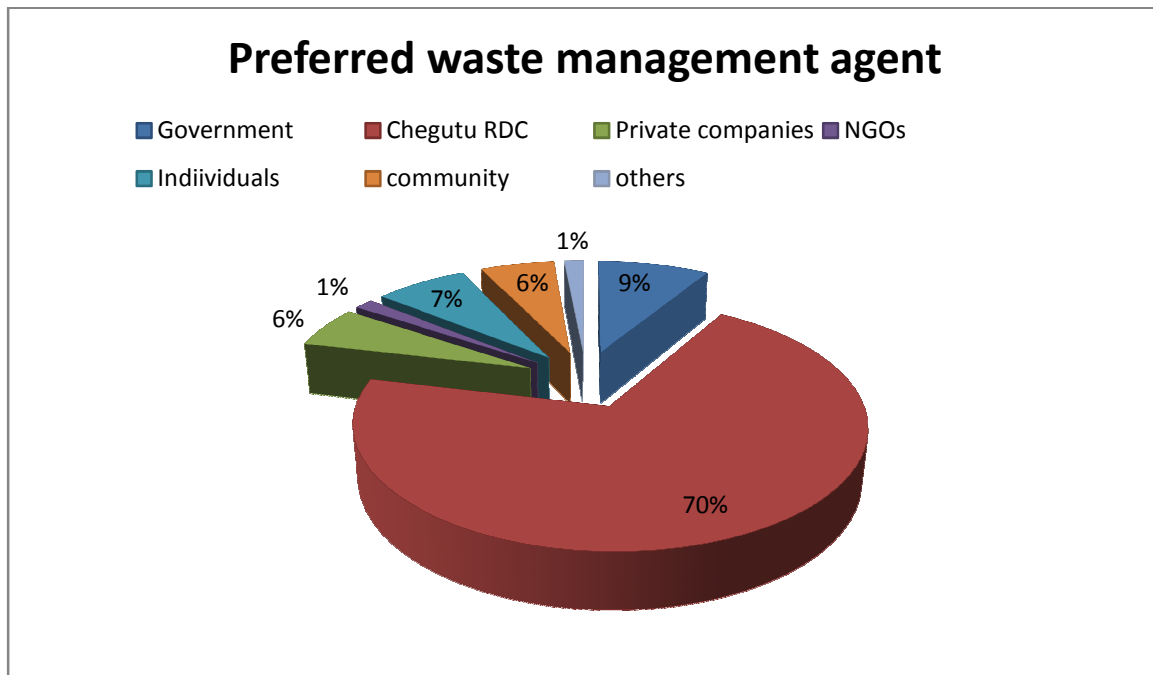


Fig 4.20 Preferred waste management agent for the households respondents

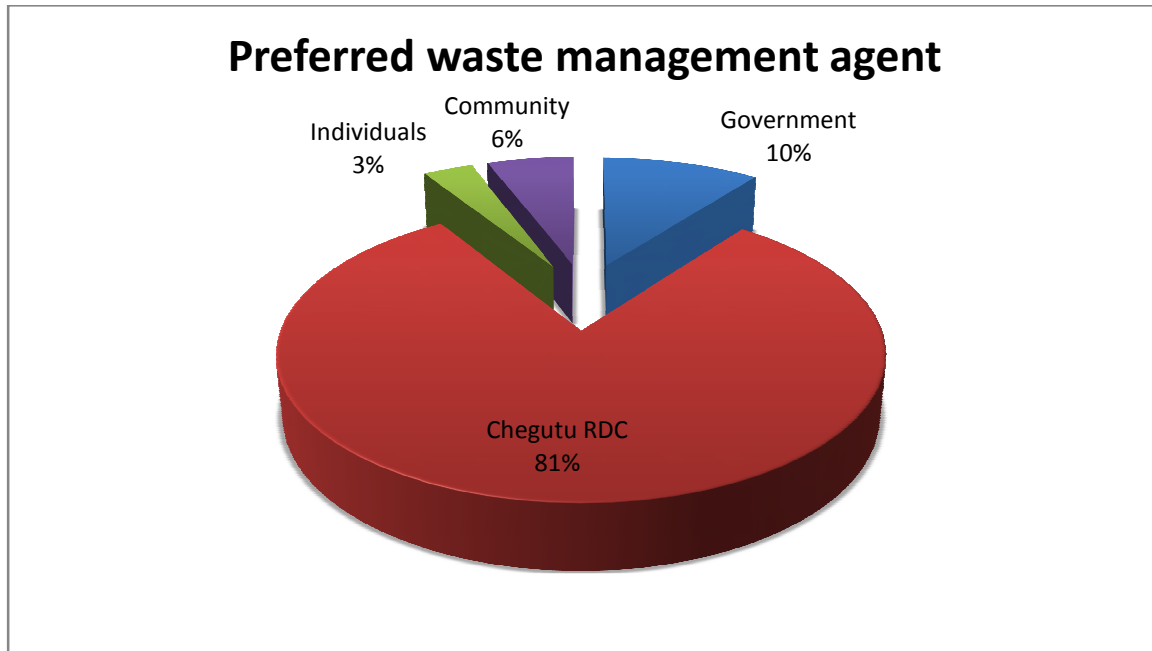


Fig 4.21 Preferred waste management agent for the business premise respondents

4.4 2 Waste Disposal

Solid waste management and disposal in Mubaira is the responsibility of Chegutu Rural District Council. Council's duty is to collect waste produced in Mubaira's residential and business premise areas and dispose it at the council's dumpsite. Residents as well as business entities have their own waste disposal strategies that they engage in which include the use of pits, burning of waste as well as open dumping. This is because council is not managing to fulfill its role as far as waste collection, transfer and disposal is concerned in Mubaira. Waste collection in Mubaira is erratic resulting in residents resorting to their own means of waste disposal. These waste disposal strategies are not environmental friendly and some are even illegal but from the survey carried out, residents felt that they had no option but to resort to those methods as council was not doing much to help them as far as solid waste management was concerned.

According to council, after waste has been collected by council, it is taken to a registered council dumpsite which is located a few kilometers from Mubaira growth point. According to the Planning officer at Chegutu Rural District Council, this dumpsite was formerly used as a gravel pit and now council is reclaiming it by using it as a dumpsite. The dumpsite however is not lined to prevent leachate from sinking into the ground and contaminating ground water supplies. This

poses a great risk to the residents in Mubaira as their water is drawn from boreholes which in turn extract water from ground water storages. The dumpsite is also not fenced to protect it from scavengers including animals and to protect waste from being blown away by wind thereby polluting the surrounding areas. In an interview with the Environmental Management Agency (EMA) District Environmental Officer for Chegutu District, he pointed out that the council dumpsite was not being managed properly as there was haphazard dumping of waste with no environmental protection measures in place. Council however reported that funds had been sourced to fence the dumpsite.

Chegutu Rural District Council does not have permanent employees for waste/refuse collection and management, rather 6 people who are hired on a contract basis. These people are not trained on how to handle and manage waste which makes the system somewhat inefficient and hazardous to waste handlers. There is need for a professional waste management team with well trained personnel in solid waste management for the system to efficiently and effectively work. Council also does not have a refuse compactor or truck allocated for waste management, a truck is hired for waste collection. This reduces the efficiency of waste collection as the truck may not always be available for council to use it.

Awareness campaigns are being used world wide as a means of communicating and educating members of the public on important issues in our day to day lives. They are very effective as they even reach those who do not have access to common means of media such as radios, televisions and newspapers. Chegutu Rural District Council confirmed that it had held awareness campaigns in a bid to try and reach out to the public in issues to do with properly managing solid waste. This was done so that the public's efforts may complement council's efforts thereby bringing about an efficient system and a cleaner environment. In interviews held with Council executive members, an appeal was made to other stakeholders in waste management, particularly the Environmental Management Agency (EMA) to complement council's efforts by adopting an educative approach on solid waste management issues. It also appealed to government to deliberate more on sanitation and hygiene, for example, funding for Water, Sanitation and Hygiene (WASH) programmes should cover all aspects rather than concentrating only on water. Sanitation and hygiene issues should be covered as they cover equally important issues of solid waste management which overally translate to sanitation and hygiene.

4.4 3 Waste Management Practices and Residents' perceptions and attitudes

As highlighted before, waste management practices that are most common in Mubaira are the use of pits, burning as well as open dumping. Only a small proportion use bins for waste storage. Although this could be largely blamed on the local authority's failure to erect an effective waste management system, residents' perceptions and attitudes also contribute to waste management problems. **Tables 4.17** and **4.18** show the responses of both target populations on the responsibility of waste at home or business premises. Quite a large proportion (46%) which mainly comprised of male respondents gave away responsibility of waste management at household level to either their wives and children.

Table 4.17 Households perceptions on waste responsibility

Responsible person for waste disposal				
Responsible person	Frequency	Percent	Valid Percent	Cumulative Percent
Mother	5	7.1	7.1	7.1
Self	10	14.3	14.3	21.4
Children	11	15.7	15.7	37.1
Mother and children	14	20.0	20.0	57.1
Everyone	30	42.9	42.9	100.0
Total	70	100.0	100.0	

Source: Field survey (2014)

Table 4.18 Business premises' responses on waste responsibility

Responsible person for waste disposal

Responsible person	Frequency	Percent	Valid Percent	Cumulative Percent
General hand	11	36.7	36.7	36.7
Employees	3	10.0	10.0	46.7
Everyone	1	3.3	3.3	50.0
Self	15	50.0	50.0	100.0
Total	30	100.0	100.0	

Source: Field survey (2014)

Solid waste management should be everyone's responsibility so that everyone's environment is kept clean and habitable without any potential health or environmental hazards from solid waste. Questioned on who is responsible for the disposal of waste at household level, some respondents pointed out that their wives and children were responsible, others said their children, only a few reported that everyone including themselves were responsible. This shows already that some residents especially heads of households (in most cases men) do not bother themselves with issues to with solid waste management even at household level as they consider it someone else's responsibility. This could be because of the social constructs of society or gender stereotyping which views certain chores like waste management at household level to be for women and children only. This kind of attitude is not helpful especially at household level where waste is expected to be everyone's responsibility to ensure a clean and healthy environment. For the business premises it is understandable when waste management is set aside for specific people. Normally waste management at a business premise is the responsibility of the general hands who are actually employed for such duties. This however is not always the case especially for small business entities like general dealers, flea markets and bottle stores. Such business premises do not employ general hands but rather they make use of those who would have been hired to tend in the shop whether as shopkeepers or attendants. This is done to cut costs on hiring employees.

Residents' attitudes on waste disposal may also contribute to challenges of waste management. Some residents are ignorant when it comes to solid waste disposal issues. Some actually know that burning waste as well as open dumping are illegal practices but because of ignorance they go on to burn their waste as well as dumping it illegally all in the name of keeping their environments clean. Some residents are just used to the norm that even when there is no excess waste at their disposal they still go on to burn and dump waste indiscriminately. This attitude towards waste undermines efforts by council and other stakeholders in trying to promote environments that are free from pollution and diseases. These practices of burning and waste dumping actually promote health hazards that affect the public. **Plates 4.3** and **4.4** show evidence of such practices in Mubaira.



Plate 4.3 Waste burning at a dumpsite in Mubaira



Plate 4.4 Evidence of indiscriminate waste dumping in Mubaira

When asked whether they were aware of any legislation to do with solid waste management, 45.7% of the 70 household respondents roughly knew that there was some legislation which prohibited the disposal or discarding of waste on the ground or surfaces which are not set aside for such purposes. 54.3% of the respondents were not aware, which could be because of ignorance or lack of access to such information. For the business premise respondents, 67% were aware of legislation to do with solid waste management whilst the remaining 33% were not aware. The knowhow of such legislations will have a bearing on the residents' attitude towards waste disposal as it may reduce illegal practices of waste disposal like open dumping just for the fear of being prosecuted. The public needs to be educated and made aware of the law so as to try and cultivate a new attitude towards waste management by the general public. This will greatly reduce problems of indiscriminate waste dumping and burning of waste. Therefore, there is need for proper publication of environmental management legislations, laws and by-laws so that the public may be aware of them.

Residents also believe that council is responsible for waste management hence, they do not have to do anything when it comes to waste management. This kind of attitude actually holds back progress as well as efforts by council to efficiently manage waste. For example, on waste separation, they believe that council workers should separate the waste after collection. Residents respond in that manner probably because practices like waste separation have not been properly

communicated to them hence the level of resistance. Another case to note is one in which council placed strategic communal collection points where residents are supposed to take their waste for collection by council. Most residents do not even bother to take their waste to these points as they believe that council workers should be the ones to collect the waste right at their doorsteps. Such resistance could be brought about because residents feel they were never consulted as the service users. Council should hold consultation meetings with members of the public so as to communicate such issues, this will make members of the public feel important and cultivate a sense of responsibility in them. Resistance in such cases would be greatly reduced making the solid waste management system more efficient because there will be participation of both stakeholders. A democratic public process of formulating municipal solid waste goals is essential to determine the actual needs of citizens so as to be able to prioritize limited municipal resources in a just manner (Marshall and Farahbakhsh, 2013).

4.5 Safety and Health Hazards associated with waste disposal at Mubaira

Solid waste, if not properly managed can expose residents as well as waste collectors to safety and health hazards. Improper solid waste management may result in disease outbreaks like cholera and typhoid as well as environmental hazards like land, air and water pollution. Residents in Mubaira showed that they knew that solid waste may lead to disease outbreaks like cholera and typhoid but however they did show a form of ignorance concerning the gravity of this matter. To them, disease outbreaks like cholera and typhoid were directly caused by food poisoning. Quite a significant proportion of the respondents (87%) knew a number of diseases that could be brought about by solid waste but quite a few actually believed that to be really true. Council together with other stakeholders need to hold public awareness campaigns to educate these people so as to avoid catastrophic events like the 2008 cholera outbreak which claimed lots of lives in Zimbabwe.

Mubaira residents use borehole water which is extracted from underground water storage. With the increasing levels of open dumping as well as use of an unlined dumpsite can expose residents to health hazards from contamination of water by leachate from dumps. Residents in Mubaira need to be educated and made aware of the dangers that they can be exposed to due to mismanagement of solid waste. Residents who live close to dumps are exposed to diseases like cholera and malaria which can be spread by flies and mosquitoes from the dumps. Dumpsites can

act as breeding grounds for flies and mosquitoes as well as rodents which are disease vectors which can spread diseases. During the survey, residents were asked if they were aware of any health and environmental hazards that can be caused by solid waste. Of the business premise respondents, 36.7% confirmed that they were aware of environmental hazards whilst 63.3% were not aware, 86.7% of the same target population confirmed that they were aware of health hazards associated with solid waste. Of the 70 respondents from the household target population, 87, 1% confirmed that they were aware of health hazards associated with solid waste and they brought about diseases like cholera, typhoid, malaria and dysentery among other diseases that could be caused by solid waste.12, 9% were not aware of environmental hazards associated with solid waste whilst the remaining 35.7% were not aware. **Figs 4.22 and 4.23** show the level of awareness of environmental and health hazards from the households target population.

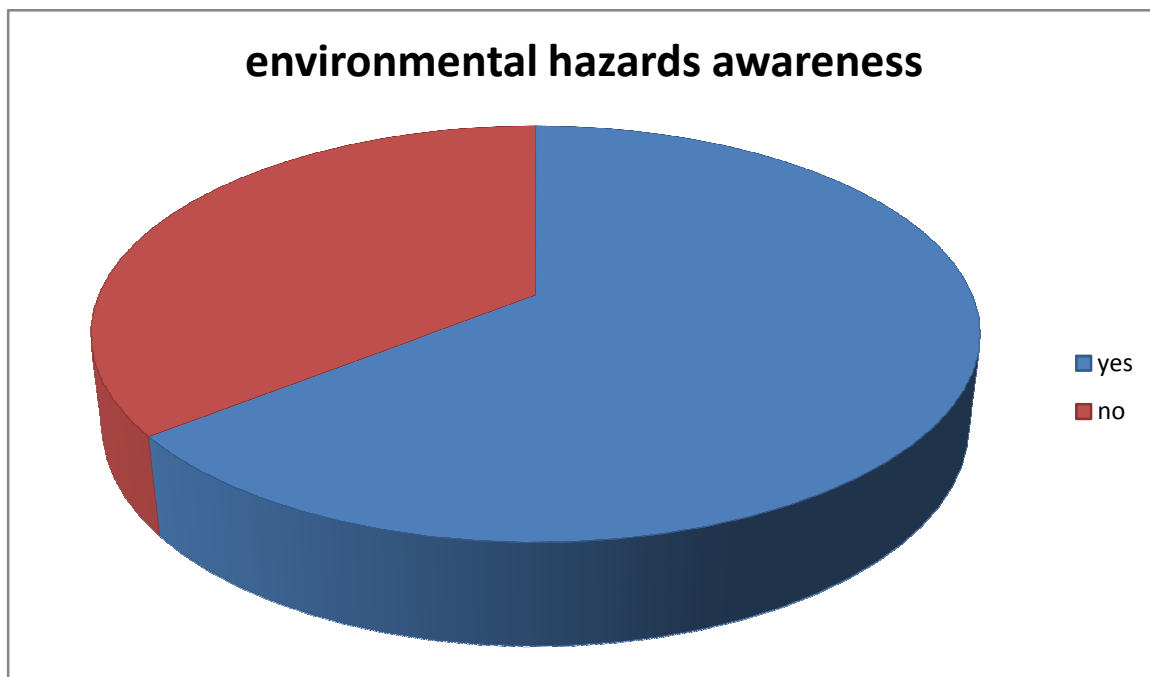


Fig 4.22 Environmental hazards awareness in the households target population

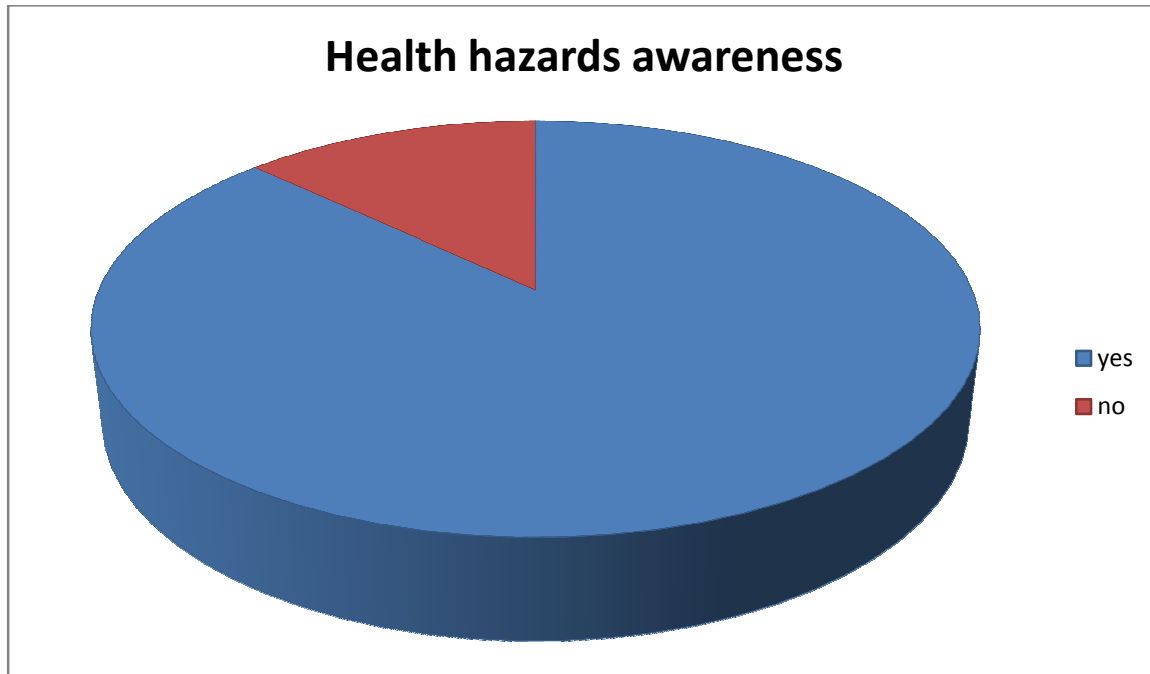


Fig 4.23 Health hazards awareness from the households target population

According to **Fig 4.22**, over half of the respondents indicated that they were aware of environmental hazards associated with solid waste. This proportion however is not really representative of the actual level of awareness on the ground as most of the respondents pointed out diseases as direct examples of environmental hazards. This explains quite a significant level of awareness recorded. This could have been attributed to little knowledge in issues to do with the environment, so that they could not differentiate between the two. From the demographic characteristics of the household respondents, a very small proportion had proceeded up to Advanced level and beyond. However, environmental hazards are closely linked to health hazards as they may trigger disease outbreaks. For example, an environmental hazard like water pollution may in turn trigger disease outbreaks like cholera and typhoid through water contamination. According to **Fig 4.23**, over 75% of the respondents indicated that they were aware of the health hazards associated with solid waste. Although most people were aware of these hazards, quite a few really believed that waste could trigger such health hazards. Most of them believed that disease outbreaks were caused by consuming poisoned or contaminated food or water. This calls for environmental awareness campaigns to educate the public so that they become aware. **Figs 4.24** and **4.25** show the level of awareness of environmental and health hazards associated with solid waste.

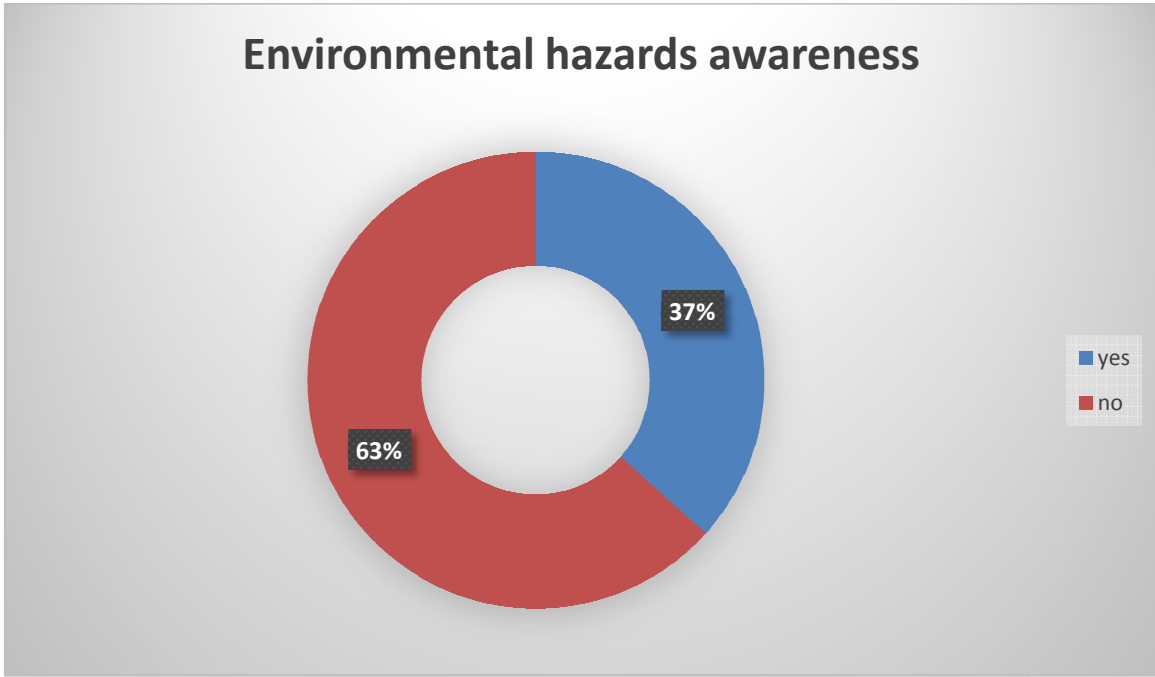


Fig 4.24 Environmental hazards awareness from the business premise target population

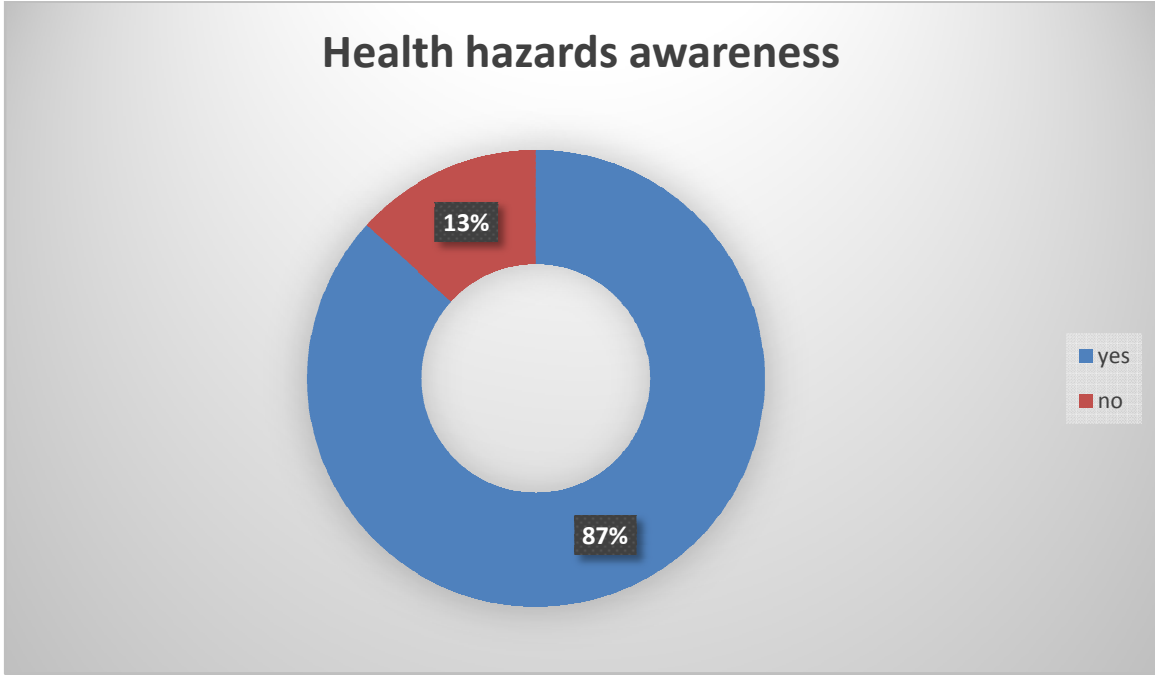


Fig 4.25 Health hazards awareness from the business premise target population

The level of awareness of environmental hazards from the business premise target population was very low as indicated in Fig 4.24. One would expect those who are formally employed to be better informed in most issues. This is not the case in Mubaira as just 40% of those interviewed in the business premise target population had gone up to Advanced level and beyond. Also, jobs like shop keeping, bartending and managing a flea market do not require lots of qualifications especially in rural areas. This explains why about 60% of the total business premise respondents were not aware of environmental hazards associated with solid waste. Those who were aware were even able to differentiate between environmental hazards and health hazards. The level of awareness for the health hazards was high, with over 80% of the respondents indicating that they were aware of them. Overall, the public is more aware of health hazards that are associated with solid waste than they are aware of environmental hazards. Environmental education is needed to increase awareness so as to improve solid waste management by both the service users and the service providers. Table 4.19 shows the most commonly reported environmental health and injury issues associated with solid waste management.

Table 4.19 Environmental health and injuries

Source	Effects
contaminated leachate and surface runoff from land disposal facilities	<ul style="list-style-type: none"> • affects down gradient ground and surface water quality
Methane and carbon dioxide air emissions from land disposal facilities	<ul style="list-style-type: none"> • add to global warming and subsequently vector-borne disease abundance and pathogen survival
Volatile organic compounds in air emissions	<ul style="list-style-type: none"> • altered cancer incidence, birth defects, infant mortality, psychological stress for those living near solid waste incinerators or inadequately controlled land disposal facilities
Animals feeding on solid waste	<ul style="list-style-type: none"> • provide a food chain path for transmitting animal and human diseases

Uncollected wastes retaining water and clogged drains	<ul style="list-style-type: none"> • create stagnant waters which encourage mosquito vector abundance • providing food and breeding sites for insect, bird and rodent disease vectors
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Source: UNEP Report (1996)

Apart from the hazards that can be faced by the residents in the local community, solid waste can also pose serious occupational hazards associated with waste handling to the waste collectors. Waste collectors may be exposed to infections, chronic diseases as well as accidents. **Table 4.20** shows the occupational health and injury issues that are commonly reported in solid waste management.

Table 4.20 Occupational and health hazards

Hazard category	Hazard effects
Infections	<ul style="list-style-type: none"> • Skin and blood infections resulting from direct contact with waste and from infected wounds • Eye and respiratory infections resulting from exposure to infected dust especially landfill operations • Intestinal infections that are transmitted by flies feeding on waste • Different diseases resulting from bites of animals feeding on the waste • Headaches and nausea from anoxic conditions where disposal sites have high methane, carbon dioxide and carbon monoxide concentrations
Chronic diseases	<ul style="list-style-type: none"> • Chronic respiratory diseases including cancers resulting from exposure to dust and hazardous compounds
Accidents	<ul style="list-style-type: none"> • Bone and muscle disorders resulting from the handling of heavy containers and driving heavy landfill and loading equipment • Infecting wounds resulting from contact with sharp objects which may lead to tetanus infections, hepatitis and HIV infection • Poisoning and chemical burns resulting from contact with small

	<p>amounts of hazardous chemical waste mixed with general waste</p> <ul style="list-style-type: none"> • Injuries at dumps due to surface subsidence, underground fires and slides
--	---

Source: UNEP Report (1996)

From observations made during the survey, waste collectors hired by Chegutu Rural District Council do not use any protective clothing during waste collection. They use bare hands to carry waste containers without dust masks covering their mouths and noses. They do have even work suits or overalls to cover their clothes during waste collection. This increases the risk of contaminating diseases during waste handling.

4.51 Solid waste management and the legal framework

Zimbabwe does not have a Waste Management Act in place, rather, waste management is being guided by policies and regulations embedded in other acts. Some of the acts include the Environmental Management Act (EMA) CAP 20:27 of 2002 and the Public Health Act of 1996. According to the EMA Act CAP 20:27 Statutory Instrument (SI) 6 of 2007 which deals with Effluent and Solid Waste Disposal Regulations, waste generators except at household level are required to come with waste management plans each year, implement and adhere to that plan. It also requires every local authority to also draft a waste management plan that they should adhere to.

Part v of the SI talks about waste collection and management which requires all local authorities to designate suitable sites as waste collection sites within its areas of jurisdiction for the management of wastes and ensure a waste collection frequency that minimizes accumulation and avoids decomposition of waste on collection sites. Chegutu Rural District Council also operates under the Rural District Councils Act which allows councils to come up with by-laws that help them in managing their areas of jurisdiction. By the time this survey was carried out, Chegutu Rural District Council did not have any by-laws to do with solid waste management but still the responsibility of waste remained.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Results of this study have revealed that solid waste management in rural areas of Zimbabwe, specifically Mubaira is inefficient and unreliable. This has been caused by the absence of a proper solid waste management plan by Chegutu Rural District Council which clearly sets out how solid waste is to be managed in Mubaira. This is further exacerbated by challenges which include lack of financial resources, well trained personnel and equipment which include waste collection trucks. Lack of residents' cooperation is also drawing back efforts by council in solid waste management.

Solid waste management in Mubaira is characterized by an erratic collection system which makes the system very unreliable. Waste is rarely collected which has resulted in the sprouting of environmentally unfriendly waste disposal strategies like illegal dumping and burning. Solid waste management practices like waste minimization are not being fully practiced in Mubaira with only an insignificant proportion of the residents engaged in practices like waste separation and reuse. Furthermore, these practices are being done with little appreciation of their importance in waste minimization and overall solid waste management. Council on its part is failing to fully carry out its duties as far as waste collection is concerned and also an unlined dumpsite is being used for the disposal of the solid waste in Mubaira. All these issues need to be addressed by the relevant authorities so as to restore order in terms of waste management. Council together with the relevant stakeholders need to work together in solving the problem of waste in Mubaira. An intergrated solid waste management plan need to be drafted and implemented so as to deal away with the numerous problems associated with solid waste. Top down approaches need to be adopted by the responsible authorities and other stakeholders so as to holistically approach the problem and come up with a solution that everyone will be comfortable with. In order for all this to take place, a number of recommendations were drawn from this study in trying to help Chegutu Rural District Council and any other institutions that are facing the same predicament deal with their problem.

5.2 Recommendations

From the findings of this research, recommendations can be drawn so as to help Chegutu Rural District Council as well as other Rural District Councils in managing their waste.

- ❖ Chegutu Rural District Council needs to come up with an Integrated Solid Waste Management System plan. This would help in reducing waste amounts at source thereby reducing the total amount of waste that would be collected and disposed of at the council dumpsite. Intergrated solid waste management includes practices like re-using, waste separation, recycling as well as reducing. This needs the inclusion of other stakeholders by Council for its effectiveness. Such stakeholders include the Environmental Management Agency (EMA), waste recycling companies, schools and the community.
- ❖ Council may also engage EMA in public awareness campaigns, educating the public on the importance of proper solid waste management. Some practices being done by the public are due to lack of awareness, hence the need for awareness campaigns. Environmental education in schools would be very helpful in reducing solid waste in Mubaira as the young children are also important residents who contribute to the problem of waste management. The catch them young approach is very appropriate as it would deal away with the ‘throw away’ attitude that is so rampant within school children. Environmental education in schools could help cultivate an environmentally aware generation which would erase environmental problems such as solid waste management in the long run.
- ❖ Chegutu Rural District Council needs to improve its communication with the public. It was gathered from the research that most of the residents were not even aware that waste was to be collected from selected communal collection points. This shows that however the information was communicated, it did not reach all of its intended audience. This further breached the solid waste management system in place rendering it ineffective.
- ❖ Council should conduct public consultation meetings when making decisions that affect members of the public. This will reduce resistance and improve participation and cooperation levels by the public. For example, in setting up their collection schedule, Chegutu Rural District Council should have consulted members of the public on sites to set up as communal collection points, dates of collection as well as time of collection. This would have been effective as members of the public would be in a position to know

better what suites them and what they are comfortable with. This would also give them a sense of ownership or belonging which would reduce resistance.

- ❖ Council should come up with a waste collection system that is efficient and stick to it. A clear timetable should be provided to the public so that they may be made aware and respond in time for the collection. Waste collection frequency should be increased in periods where waste production is high as indicated in the research, for example during the holidays as well as the November to January period.
- ❖ Council should source funds to enable it to procure proper equipment for use in solid waste management. Funds are also needed for the proper maintenance of the council dumpsite which include lining and fencing of the dumpsite. Well trained personnel in solid waste management are needed so as to increase the efficiency of the system.
- ❖ The problem of waste may be accelerated by the absence of waste bins. Council should make an effort to provide bins to households for waste storage as well as strategically placing bins at the business centre so as to reduce the problem of littering, burning as well as the indiscriminate dumping of waste.

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Appendix 1

Questionnaire Guide: for the general public at households and business premises

Questionnaire number

Questionnaire on the solid waste management system employed at Mubaira growth point by Chegutu RDC.

Purpose

The aim of this questionnaire is to solicit information regarding the solid waste management practices in place at Mubaira in order to assess the effectiveness in ensuring a waste free environment. The information that you are going to provide will be kept confidential and will only be used for academic purposes.

InterviewerRumbidzaiTakaedza

PlaceMubaira growth point

Date2014

SECTION A: Personal data(Please tick where applicable)

1. Age: 21-30 31-40 41-50 51-60 60+

2. Sex: female male

3. Marital status: single married divorced widowed

4. Race: black white coloured other

5. Education: G7 O' A' Diploma Degree Post Graduate

6. Religion: Christian Moslem African Traditional religion

7. Household size:.....

8. Occupation:

9. How long have you been living in Mubaira

SECTION B: Generation, Collection and Disposal

10. What kind of solid waste do you produce daily
1.....2.....3.....
11. How much waste do u produce in a week 1) less than a bin 2)one bin 3) two bins 4)other
(specify).....
12. In what period do u produce more amount and types of waste 1) Nov-Jan..... 2) Feb-
April..... 3) May-July4) Aug-Oct
13. Is there any organised waste collection/ disposal system in your area.....
14. Do you have a refuse bin at your premises Yes.....No.....
15. If Yes, what type of bin.....
16. How often is waste collected in your area 1. Daily 2. Weekly 3. Monthly 4. Other
(specify).....
17. Do you think the frequency of waste collection is adequate Yes.....No.....
- b) If No, why.....
18. How much is council charging for waste collection.....
19. What is the mode of transport used for collecting waste.....
20. Who is responsible for the disposal of waste at your home/business
premises.....
21. What method do you use to dispose of waste at your home/ business premises in the
event that council has not collected 1) open dumping 2) pit 3) landfill 4) bin 5) other
(specify).....
22. How is solid waste currently disposed of in your
area.....
23. Is there any waste/dump site close to your home Yes.....No.....
- b) If yes, how far is it from your home.....

SECTION C: Waste Minimisation

24. Do you separate or sort your solid waste Yes.....No.....
- b) If Yes, why do you separate.....

25. How do you separate the waste.....

26. Are there any items that you reuse after their first use Yes.....No.....

b)If Yes, list the items

.....

26. Are there any waste pickers who collect materials from your waste bins or surrounding dumps Yes.....No.....

b) If Yes, which types of materials do they prefer

1.....2.....3.....

27. Do you ever arrange with waste pickers so that you set aside the kind of solid waste materials they prefer Yes.....No.....

b) If Yes, has it been helping you in managing your solid waste.....

28. Would you consider to engage the services of a cart pusher for solid waste collection in your area Yes.....No.....

b) If Yes, will you be willing to pay for the services provided.....

29. Of the listed institutions, who are you willing to pay for waste collection and disposal services 1) Government 2) Chegutu RDC 3) Private companies 4) NGOs
5) Individuals 6) Community 7)Other (specify).....

SECTION D: Challenges and Way forward

30. Are you aware of any environmental hazards associated with poor solid waste management from your home/ business premises Yes.....No.....

b) If Yes, name any two of them

.....

31. Are you aware of the health hazards that can be brought about by unattended solid waste Yes.....No.....

b) If Yes, name any two.....
.....

32. Are there any challenges that you encounter during household/ business premises solid waste management Yes.....No.....

b) If Yes, list three 1.....
2.....
3.....

33. Are you aware of any legislation to do with solid waste Yes.....No.....

b) If Yes, what does it say.....
.....

34. What do you think should be done to address these problems.....
.....

35. What role do you think Chegutu RDC should play to ensure proper solid waste management at Mubaira growth point.....
.....
.....
.....

Thank you for your cooperation!!!!!!!!!!!!!!

Appendix 2

Interview guide for: Environmental Officer, Social Services Officer, Treasurer, HR and Admin Officer and Planning Officer

1. What is your definition of solid waste
.....
.....
2. What mainly constitutes solid waste at Mubaira growth point
.....
.....
3. Does Chegutu RDC have a solid waste management system.....
4. If Yes, how does it manage the waste
.....
.....
.....
.....
5. How is waste collected in Mubaira
.....
.....
6. How many people are employed for refuse collection
.....
.....
7. What equipment and protective clothing do they use
.....
.....
8. Does Chegutu RDC have a designated and licenced area to dispose of the collected solid waste
.....
9. If Yes, is the area being properly managed to fulfil its use

.....
.....
.....

10. Does Chegutu RDC charge for the services of waste collection in Mubaira.....

11. If Yes, are the charges helping in the management of solid waste in Mubaira

.....
.....
.....

12. What challenges are being faced by your organisation in sustainably managing solid waste at Mubaira growth point

.....
.....
.....
.....

13. Did your organisation ever hold any awareness campaigns to educate the public on the importance of sustainable waste management strategies like recycling , reusing and reduction

.....
.....

14. If Yes, how was the response

.....
.....
.....

15. Were the campaigns helpful in reducing problems of improper solid waste disposal on the part of the public

.....
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16. Additional information,comments

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Thank you for your cooperation

Appendix 3

Interview guide: EMA

1. How do you define solid waste management
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2. What constitutes solid waste in Mubaira
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3. Is the solid waste in Mubaira similar to that in urban areas.....
4. If yes, what could be the reason for the similarity
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5. Are you aware of the solid waste management system being used by Chegutu RDC at Mubaira.....
6. If yes, is the system helpful in meeting its demands in Mubaira
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7. Does Chegutu RDC have a designated and licenced dumpsite for the disposal of solid waste in Mubaira.....
8. If yes, is the place being properly managed to sustainably fulfil its purpose
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9. Are the solid waste management strategies being employed by Chegutu RDC and the residents of Mubaira in conformity with EMA standards.....

10. If No, what solid waste management strategies do you recommend

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11. What do you think are the challenges being faced by Chegutu RDC in trying to fulfil their duty of managing solid waste at Mubaira

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12. How do you deal with those who do not comply with your regulations

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13. Additional information on the topic of discussion

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Thank you for your cooperation

Appendix 4

Observation checklist

Things to be observed

1. Council's vehicles for collecting waste
2. Collection points
3. Types of solid waste generated
4. Presence of illegal dumps
5. Evidence of burning of waste in pits/dumpsite
6. Waste management strategies at household/ business premises
7. Waste collecting bins

