COMMUNITY PARTICIPATION IN SUSTAINABLE SOLID WASTE MANAGEMENT IN HIGH DENSITY SUBURBS.THE CASE OF MBARE, HARARE, ZIMBABWE.

BY

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A DISSERTATION SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES IN PARTIAL FULFILLMENT OF THE BACHELOR OF SCIENCE HONOURS DEGREE IN GEOGRAPHY AND ENVIRONMENTAL STUDIES.

MIDLANDS STATE UNIVERSITY

JUNE 2014

MIDLANDS STATE UNIVERSITY

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

APPROVAL FORM

The undersigned clearly attest that they have read and recommended to the Midlands State University for acceptance a dissertation entitled: **Community participation in sustainable solid waste management in high density suburbs. The Case of Mbare, Harare, Zimbabwe.**

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Declaration

I declare that this is my own work and material used from other sources to compile this dissertation has been fully acknowledged.

Dedication

This dissertation is dedicated to my beloved father, mother, as well as my brothers and sisters whose concerted efforts and sacrificial love throughout the completion of this project have made my dream a reality. May the Almighty God prolong your lives so that you reap the fruits of your efforts.

Acknowledgements

First and foremost I would like to express my heartfelt gratitude to the Almighty God in whom all things are possible. My sincere appreciation goes to my academic Supervisor Mr. S Jerie for guiding me through in undertaking this entire project. His motivational, innovative, constructive and creative mind as well as his unwavering moral and academic support towards the success of this project is highly appreciated. I am really grateful for his supervisory role.

I also extend my sincere appreciation to the Nenyere residents in Mbare for their commitment and contributory responses during my questionnaire administration and focus group discussion exercise. Special mention goes to the City of Harare Waste Management Department Operations Manager, Project Officers from Oxfam, Practical Action, Environmental Management Agency and Environment Africa, ZELA Director, St Peter's Church Wardens, Chairpersons of Anotidaishe, Jabulisa and Zeza Tsvina Community Health Clubs as well as the Director of Tisunungureiwo Recycling Cooperative in Mbare for their cooperation and immense contribution during the interviews. Their views, sentiments and ideas were worthwhile in revealing the nature, extent and effectiveness of community participation in solid waste management thus giving me an insight of what is really transpiring in Mbare.

I would also like to express my profound gratitude to the Zamba family for their unwavering support in financial and moral terms throughout my degree programme and compilation of this dissertation. I also salute the Geography and Environmental Studies staff members for their valuable service of providing untiring moral and academic support during my 4 year period. I am tremendously grateful since their contribution has brought this project to fruition.

Abstract

Solid waste management has become one of the contemporary issues of the 21St Century at local, national, regional and global scale. Studies on community participation in developing countries have been done but up to date gaps exist in the documentation of the real community based projects in solid waste management, challenges affecting full community participation as well as suggested solutions. The impacts of the suggested solutions are only superficially dealt with. This study examined the roles and effectiveness of communities in solid waste management in high density residential areas so as to come up with sustainable solid waste management options with respect to Nenyere area in Mbare, Harare. The study area was purposively selected by the researcher to assess the roles and effectiveness of the community health clubs and waste recycling cooperatives in the Water, Sanitation and Hygiene programmes (WASH) and the Urban Environment Programmes meant to empower the communities to embark in solid waste management activities in their neighbourhoods. The area was also selected by virtue of its ever growing population and unsustainable waste handling and disposal practices which are likely to make it vulnerable to disease outbreaks. To achieve this, semi structured interviews and 100 questionnaires from systematically selected residents were used to obtain information on the various solid waste management activities done at community level from residents and key informants from various organisations that deal with solid waste management issues respectively. Photos, observations and focus group discussions assisted the researcher to unearth the evidence on the ground. Information obtained include socio-demographic data, types and quantities of solid waste generated weekly at household level, activities undertaken by the communities in solid waste management, supporting organisations, challenges encountered, environmentally sound solid waste management strategies as well as legislation and institutional aspects. Research findings revealed that organic waste dominated the solid waste stream and accounted for over 50% of the solid waste generated at household level. Quantity of waste generated was positively correlated to household size. Composting, clean-up campaigns, waste sorting, recycling and education awareness are the main activities undertaken with support from different organisations. Minimum awareness on legislation and institutional aspects negatively affect the community's compliance to legal obligations. In light of these findings, the researcher recommends that full technical and financial support must be offered to community health clubs and recycling cooperatives by the private sector, non-governmental organisations and local authority. Environmentally sustainable solid waste management practices guided by the principles of the integrated approach and invigorated by environmental education must be fully adopted.

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Acronyms

COH	-	City of Harare
DEFRA	-	Department for Environment Food and Rural Affairs
EMA	-	Environmental Management Agency
EPA	-	Environmental Protection Agency
ILO	-	International Labour Organisation
ISWM	-	Integrated Solid Waste Management
LEAP	-	Local Environmental Action Plan
MDG	-	Millennium Development Goals
MET	-	Ministry of Environment and Tourism
MLGRUD	-	Ministry of Local Government, Rural and Urban Development
MSW	-	Municipal Solid Waste
NGOs	-	Non Governmental Organisations
NIMBY	-	Not in My Backyard
SARDC	-	Southern Africa Research and Documentation Centre
SIRDC	-	Scientific and Industrial Research and Development Centre
SPSS	-	Statistical Packages for Social Sciences
UN	-	United Nations
UNCED	-	United Nations Conference on Environment and Development
UNEP	-	United Nations Environment Programme
USAID	-	United States Agency for International Development
WASH	-	Water, Sanitation and Hygiene
ZELA	-	Zimbabwe Environmental Law Association
ZWN	-	Zero Waste Nepal
ZUEP	-	Zimbabwe Urban Environment Programme

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CHAPTER 1: INTRODUCTION

1.1 Background to the study

Solid waste management refers to a discipline associated with the control of the generation, storage, collection, transfer, transport, processing and disposal of solid waste in a manner that is in accordance with the best principles of public health, economic engineering conservation, aesthetics and other environmental considerations and that is also responsive to public attitudes (Tchobanoglous, 1993).Yap (1995) defined solid waste management as the storage, collection, transportation and disposal of solid waste in a timely manner to prevent disease outbreaks, minimize fire outbreaks and reducing aesthetic insults arising from putrefying organic matter. Bhatia, (2003) also defined solid waste management as the disposal of discarded material in a manner that is environmentally acceptable. Tchobanoglous (1993) opines that the problem of solid waste disposal can be traced from the time when humans first began to live in tribes, villages and communities and the accumulation of waste became a consequence of life. Food waste and other solid waste in medieval towns on unpaved streets, roadways and vacant land led to the proliferation of disease-carrying vectors such as rats and flies.

Tchobanoglous (1993) and Otten (1996) further asserted that, the lack of solid waste management plans during that period led to the Black Death epidemic that devastated half of the Fourteenth Century Europeans and caused many subsequent epidemics with high death tolls. During the late 19th Century after the Black Death tragic in Europe, promulgation of sanitary laws was done to prohibit the dumping of solid waste into ditches and water bodies. However, public officials introduced public health control measures after a strong realization that food wastes have to be collected and disposed of in a sustainable and sanitary manner so as to control rodents and flies. Otten (1997) postulated that Agenda 21 of the UNCED in Rio de Janeiro, 1992 identified waste management among other environmental issues as of great concern to the global community. Agenda 21 sets out a framework of objectives and activities aimed at minimising wastes, maximising environmentally sound reuse, recycling and promoting safe waste disposal.

UNEP (2009) asserted that the global scale waste generation is increasing at a faster rate as buttressed by Mensah (2005) and Manyanhaire (2009) in their study in Ghana and Zimbabwe respectively. In 2006 the global amount of Municipal solid waste generated was 2, 02 billion

tonnes which represented an annual increase of 7% since 2003 (UNEP, 2009).Most urban areas in Africa are encountering a myriad of solid waste management challenges as a result of the ballooning urban population and inadequate resources as compared to the colonial period when the urban population was lower and resources were adequate. Kaseke (2005) highlighted that in East African countries such as Uganda, Kenya and Tanzania policies encouraging community participation in solid waste management at household level have been formulated and implemented. These communities have embarked on composting activities.

In Zimbabwe in 2004 the Ministry of Environment and Tourism called for the formation of a National Taskforce to tackle waste management issues in the country. The Environmental Management Agency took the lead in the development of the National Sustainable Development Strategy that would spearhead action and outline activities to be carried out in order to effectively manage waste. A multi- sectoral approach was used whereby different sectors of the society have tried to cooperate so as to find lasting solutions to this perennial problem of waste management. These stakeholders include Local Authorities, industries, non-governmental organisations, research institutions and the public. From this perspective, a holistic approach to the problem is needed and this requires cooperation with interested and relevant stakeholders.

MET (2007) has highlighted that through community participation, it has been noted that about 40% of the population is made aware of sustainable waste management practices and legislative requirements pertaining to waste management. Community based groups can raise public awareness and share knowledge to cultivate values, skills and behaviour among the population which is consistent with sustainable environmental management. Negative attitudes on wanton littering inherent in some communities are changed. The participatory approach to promote integrated sustainable development planning by communities empowers them to manage their environment sustainably.

According to Practical Action (2007), more than 2.5 million tonnes of household and industrial wastes are produced per annum in urban areas and this continues to rise due to unprecedented urban growth rate which stands at 30% for Zimbabwe and the absence of waste minimization strategies. Areas worst affected are low income residential areas and informal settlements with some not receiving service at all. In line with this, the challenges of waste management have become a growing concern for the national government, local authorities, environmentalists,

researchers and the community at large. Zuburg (2002) asserted that there is an increase in the amount of waste generated at household level yet there has not been a requisite collection and disposal services.

Mubaiwa (2007) articulated that due to the absence of an effective enforcement strategy coupled with the lack of innovative initiatives in handling solid waste, it has left the local authorities with a mammoth task in their hands. It is against this background that the implementation of community based waste management initiatives improves the urban environment. Many ways of managing solid waste can be employed by communities particularly community based groups, recycling cooperatives and community health clubs for their economic development and the protection of their neighbourhood from environmental pollution. They can participate in decision making such as deciding which waste in the community should be collected by a community based enterprise and whether it will be recycled, delivered to the dumpsite or treated. They can engage in recycling used papers, collecting plastic containers and scrap metals for their economic survival. Community based waste management groups can also participate in raising awareness on the importance of environmental cleanliness and waste management in line with Section 4 2(d) of the Environmental Management Act.

1.2 Statement of the problem

The rapid urbanization which stands at 30 % for Zimbabwe, widespread lack of resources, lack of environmental education and awareness, minimal community participation and irresponsible behavior by citizens on wanton littering have contributed to the deplorable state of solid waste management in urban areas. In Harare, the generation of solid waste has gone beyond the handling capacity of the local authority which is grappling with a myriad of challenges which include high volumes of waste, costs involved, disposal technologies and methodologies as well as the deleterious effects of the waste on human health and the environment. This is exacerbated by inadequate storage, collection and disposal resources that are not commensurate with the population explosion currently taking place in urban areas. This is evidenced by the mushrooming of illegal dumps at Mbare Musika, Matapi Flats, Nenyere Flats, Mbare National, along the roads, at shop fronts, markets and on open spaces in Mbare. Every open space in Mbare is seen as a dumpsite for household waste due to the waste management services that have

increasingly become inadequate and due to lack of education, the community is not aware of the harmful imprints of solid waste. However, after the realization that environmental and health hazards are likely to eventuate at an unprecedented rate, interested Community Based Groups in Mbare such as Zeza Tsvina Health Club, Jabulisa and Anotidaishe Health Clubs, Tisunungureiwo Recycling Cooperative and interested residents have engaged in solid waste management to improve their environment. This is being done from an environmental justice perspective which is anchored on the premise that there exist a great link between the concept of environmental justice and service delivery especially on solid waste management issues. The various solid waste management practices include clean up campaigns, waste sorting, composting, recycling and raising awareness on environmental cleanliness. This exercise is being undertaken in partnership with the Local Authority and funding from Oxfam, Practical Action, Zimbabwe Environmental Law Association, Environmental Management Agency and Environment Africa among others. The inception of this Urban Environment Programme is aimed at making a purposeful and far reaching contribution to improved solid waste management and fight against urban poverty by promoting community participation and democratic decision making for efficient and equitable environmental and social service delivery by local authorities and public bodies in urban areas. In line with this so-called Urban Environment Programme, the community can generate income and there is also employment creation. It is from this background that this study seeks to assess the critical roles and effectiveness of communities in solid waste management in high density areas with respect to Mbare so as to come up with sustainable solid waste management options.

1.3 Objectives of the study

1.3.1 General objective

- To assess the role and effectiveness of community participation in solid waste management

1.3.2 Specific objectives

- To identify the types of solid waste generated in Mbare at household level.
- To establish the amount of solid waste generated at household level.

- To identify solid waste management activities undertaken by the community in Mbare.
- To assess the effectiveness of community participation in solid waste management.
- To come up with recommendations for sustainable solid waste management strategies.

1.4 Justification of the study

The challenge of solid waste management has become one of the topical issues of concern for the national government through the Ministry of Environment and Natural Resources Management. It is responsible for developing waste management policies, identifying recycling initiatives and negotiating with all stakeholders to develop action plans to investigate, promote and extend recycling of waste. Local Authorities responsible for waste management and cleansing services and developing Local Environmental Action Plans (LEAPs) are also facing the challenge of solid waste management in the ever-expanding urban areas. Environmentalists such as the Environmental Management Agency, Environment Africa, Oxfam, Zimbabwe Environmental Law Association and Practical Action among others have shown concern over the deplorable state of solid waste management in Harare through assisting communities in solid waste management activities such as clean up campaigns. The problem of solid waste management has also drawn attention of researchers such as the Scientific and Industrial Research Development Centre (SIRDC) and Southern Africa Research and Documentation Centre (SARDC). It has also raised eyebrows on the academic arena particularly in colleges, universities and the community at large.

There is an increase in the amount of solid waste generated at household level in high density residential areas yet the local authority lacks the apparent capacity to handle the challenge in collection and disposal services. This study will produce results that may be used by the City of Harare, Waste Management Department to tackle the solid waste management challenges it is facing and thus encouraging community participation. This will be done using the feasible initiatives and opportunities that will be produced by the study.

Furthermore, this study is critical in adding value to the body of knowledge by examining the various opportunities for improving solid waste management in Mbare and the greater Harare. In addition to this, the study will also be used by the academics for further research on the contribution of the urban communities in solid waste management and challenges in other cities of Zimbabwe. The private sector such as non-governmental organisations can also use this study

to provide the necessary assistance to the local authorities and residents at large by incentivising residents interested in waste management. The results obtained from this study will also conscietise the urban communities in Harare that community participation is not only confined to Mbare alone but in other high density suburbs, hence there is need for other communities to embark on sustainable solid waste management strategies that create a cleaner environment free from diseases.

Students undertaking Environmental studies in various institutions of higher learning such as universities, colleges and research institutions will boost their understanding on solid waste management issues and the need for a multi-sectoral approach in solid waste management. The study will also extract the socio-economic and environmental benefits that are likely to accrue to individuals, communities and the nation at large when they fully participate in solid waste management programmes and initiatives. The community will also benefit from the research since their contribution during the interviews and questionnaires administered will enlighten them. This will give them a mammoth task to sustainably manage solid waste at community and household level. This is the main gap this study seeks to close by investigating the roles of communities in solid waste management in high density suburbs and opportunities that are likely to arise, thus giving a detailed documentation of the real solid waste management activities undertaken by the community, challenges being encountered and solutions to counteract the challenges.

1.5 Description of the study area

According to Springate et al (2009), Harare is geographically located at 17^0 $51^{'}$ 50" S and 31^0 $1^{'}$ 47" E and it is situated at an elevation of 1490 metres (4865 feet).It falls in the warm temperate category and has a pleasant subtropical highland. The average annual temperature is $17{,}95^0$C which is rather low for the tropics and this is due to its high altitude position and the prevalence of a cool South Easterly airflow. It comprises three main seasons which are a warm, wet season from November to March, cool dry season from May to August and hot dry season from September to October. The World Meteorological Organisation (2012) pointed out that the average rainfall received in Harare is between 825mm to 855 mm and typically, very little rainfall falls between May to September although sporadic showers occur in most years.

Hyde et.al (2014) posited that a natural vegetation of open miombo woodlands is supported by the climate and Brachystegia spiciformis trees (misasa) dominate the local region. Julbernadia Globiflora is also a common tree of the region and syzygium cordatum and phragmites dominate the riverine ecosystems in the greater Harare. Moreso, the Jacaranda and the Flamboyant are two South American tree species introduced during the colonial era that greatly contribute to the city's colour palette together with the Bougainvillea. Nyamapfene (1991) and Chenje et.al (1998) articulated that the soils in the city are parafelaritic soils which are found in the upland areas. These soils are rich in potassium and they are derived from granite rocks that dominate the area.

According to the Zimstat (2012) Census, Harare has an estimated population of 2 098 199 people which is 16 % of Zimbabwe's total population. It has got high density areas located in the Southern, Western part and the Eastern part such as Mabvuku and Tafara.Medium and low density suburbs are located to the East and Northern part. Administratively, Harare is an independent city equivalent to a province. It is Zimbabwe's leading Financial, Commercial and Communication centre. Most industries are located in Masasa, Graniteside, Southerton, Adbernnie, Workington and Willowvale. Informal industries are dominant in high density areas such as Mbare, Highfields, Glen Norah and Glenview.

Mbare as the area under study is one of the oldest suburbs located on the Southern part of the city and it is 8km away from the city centre. Masundire (2012) pointed out that Mbare has roughly 15 000 people and it is believed that the poorest residents stay in this suburb with housing units generally overcrowded having five or more people sharing a single room. Mubaiwa (2006) asserted that it hosts the main Bus Terminus in Harare and the biggest agricultural produce market (Mbare Musika).

This high density area is dominated by the informal sector and illegal vendors are literally on every available space and though the informal sector enhances industrial expansion, adverse environmental impacts result from these activities when solid waste is generated (Feresu, 2010). Bus terminuses, shop fronts and streets are decorated by the huge uncollected garbage mounds. The trade areas in this suburb are messy due to the inadequacies of the local authority in waste management services, residents' desperate irresponsible behaviour and lack of knowledge on the harmful imprints of solid waste. Waste receptacles provided by the local authority overflow within a short space of time and this does not correlate with weekly waste collections done by

the local authority. In virtue of this, Community Based Groups are participating in solid waste management through clean up campaigns, waste sorting, reuse and recycling programmes so as to assist the local authority as well as maintaining a litter free environment.

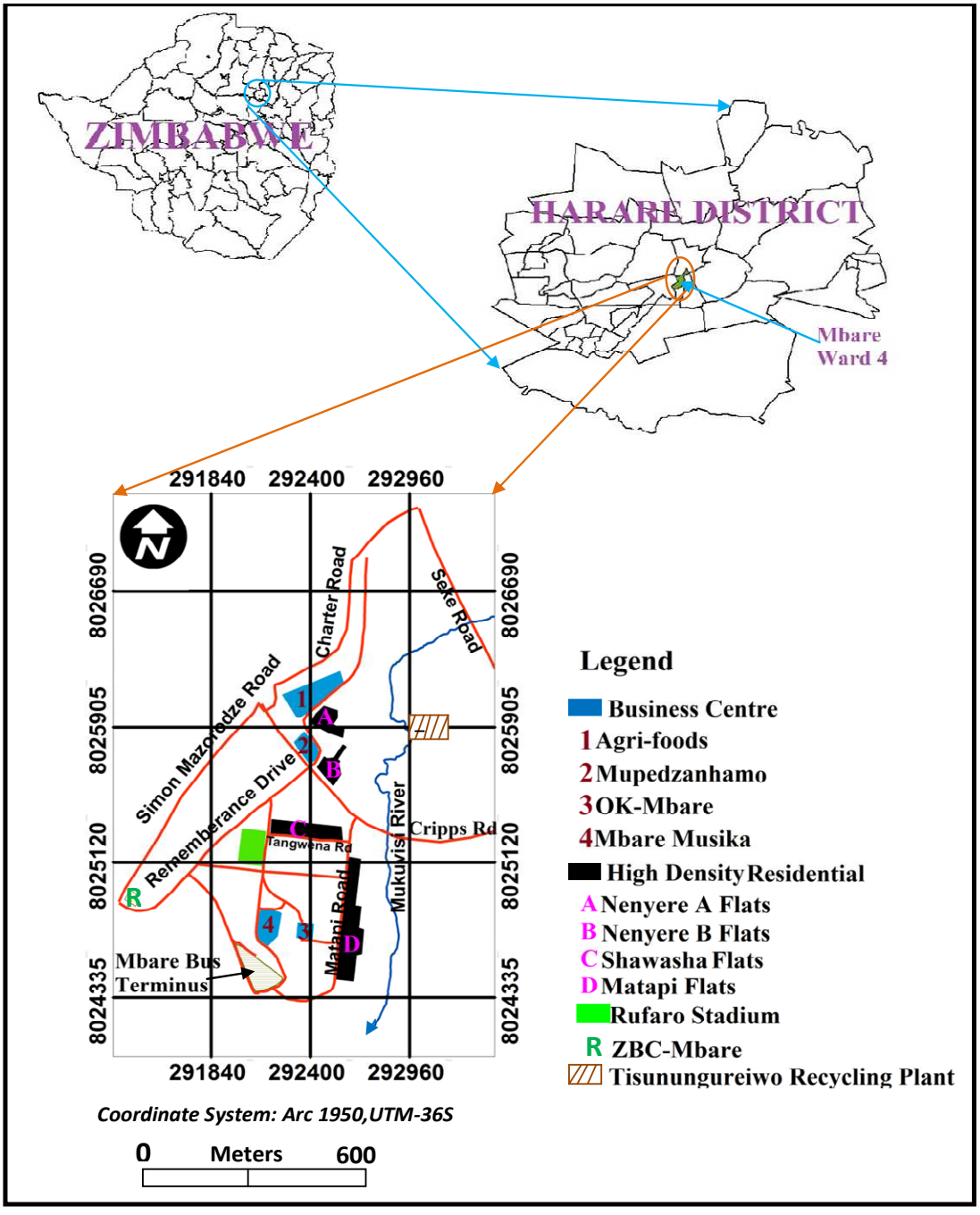

Figure 1 Map showing location of Mbare Ward 4

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter of the study examines literature related to the problem under study. Thus the chapter explores various literature on solid waste management. It examines key concepts linked to solid waste management in both the developing and developed world and variations that exist between them. The special focus of this study is on community participation in solid waste management so as to come up with sustainable waste management options. The primary objective being to find information gaps that may exist.

2.1 Definition of Waste

Defining the term "waste" remains one of the biggest challenges in the academic arena depending on how it is understood by the various schools of thought. What is considered waste by one individual will not be necessarily "waste" to another individual. This notion is buttressed by Agere (2013) who articulated that the so-called "dirt" is considered by a breed of entrepreneurs as an inherent investment and employment opportunity in efficient and effective waste management systems.ILO and SIRDC (2007) defined waste as anything or something that is no longer required by the user or original owner and has therefore been legally or illegally discarded properly or improperly. DEFRA (2012) defined waste as any substance or object which the holder discards or intends or is required to discard. It is therefore pertinent to note that waste is an inevitable by-product of any process and it is predominantly found in solid and liquid form. However, it can be categorized as domestic waste, commercial, industrial, mine waste, hazardous waste, medical waste, agricultural and E- waste.

2.1.1 Definition of Solid Waste

Cointreau (1982) defined solid waste as non-flowing organic and inorganic materials which include residues, by-products or end products in the production, distribution or consumption of goods and provision of services that are discarded by their usual owners without expecting to be compensated for their inherent value. Srivastava (2012) opines that solid waste consists of all heterogeneous mass of throw away from residential, business, commercial, industrial and agricultural activities. Due to their less economic value once they are discarded they are therefore regarded as waste. Various terms such as litter, garbage, or refuse can be used by different scholars to describe solid waste in various situations. Tchobanoglous et al (1993)

referred solid waste as solid or semi-solid materials that are of insufficient value to the possessor. The same author however use the term "garbage" to refer to food waste and interchangeably use the term "refuse" to refer to solid waste. Litter is considered as solid waste that is carelessly discarded outside by the consumers and it constitutes a highly visible portion of solid waste in urban areas.

2.2 Solid Waste Generation, Types and Sources

The classification of solid waste into different types is largely dependent on the sources where they are generated. According to UNEP (2005) there are various types of solid waste which are highly recognized by the modern systems of waste management. These types include municipal waste, hazardous waste, biomedical waste and special hazardous waste which consist of radioactive waste, explosive waste and e- waste.

2.2.1 Determinants of Solid Waste Generation

The various types of wastes are generated daily by anthropogenic activities during extraction of raw materials, their processing into intermediate as well as final products, consumption of final products and other anthropogenic activities. Technological and consumptive processes greatly result in the formation of solid waste. In line with this, it is imperative to note that waste generation largely depends on industrial, commercial, mining and farming activities more economically accelerate the quantity of waste generated. Feresu (2010) pointed out that population size and levels of industrialization aggravate waste generation rates between localities in an urban set up.

Brackley (1990) and Furedy (1989) pointed out that the quantities, composition and characteristics of solid waste generated depend on various factors and vary from one locality to another due to socio-economic factors, consumption patterns, local customs, geographical locations and seasonal variations. For instance waste generation in developed countries per capita per day is high compared to the developing regions. USAID (2009) posited that generation rates of solid waste in Africa are approximately 0.5kg - 0.8kg per capita per day as compared to 1 – 2kg per capita per day generated in developed countries. This is further supported by Tevera et.al. (2003) who articulated that Zimbabwe has an increasing trend of national average daily per capita production of solid waste which was estimated at 0.485 kilograms in 1997 but in 2000 it drastically increased to 0.58 kilograms per capita per day. According to the UN (2013) about 1.3

million tonnes of food waste is generated per annum globally. In Sub-Saharan Africa solid waste generation exceeds the collection capacity due to rapid population growth which grew by 150 % between 1970 and 1990 in the urban areas (USAID, 2009). The ballooning of population in urban areas due to the influx of the rural folks to search for employment has been observed as the impetus of generation of large quantities of solid waste.

Other factors such as attitudinal behavior, average household income, level of education and household composition also affect the amount of solid waste generated at household level. Household size strongly influences waste generation. Jones et al (2008) articulated that when the number of people in the household increases so does the amount of waste to increase. Household income and location of residential areas also play a crucial role in determining the quantity of solid waste generated. A study conducted in Harare by Kativhu (2001) of determining waste generation rates between high income households and low income households revealed that the rate of daily per capita waste generated in Gunhill, a high income residential suburb was 0.481 kilograms and Crowborough, a low income suburb recorded 0.301 kilograms per capita per day. In addition, the age profile of households is also imperative in determining solid waste generation rates. Less aluminium packaging waste is produced in households with persons aged above 60 whilst more textile and non packaging waste is produced by those below 60 years. Disposable nappies (diapers) are mostly generated in households with more infants. Salvato et.al (1982) highlighted that there is a direct positive statistical correlation between the socio-economic characteristics of households and daily waste generation.

2.2.2 Types of Solid Wastes and Sources

As alluded before, the types of solid waste generated are determined by the sources from which they are generated. Broadly speaking, these types of solid waste are categorized as municipal solid waste, industrial solid waste, hazardous waste and agricultural waste.

2.2.3 Municipal Solid Waste

This refers to solid waste that is generated from residential areas (households), food outlets, offices, hotels and other institutions just to mention a few. Yap (1999) posited that municipal solid waste encompass market waste, yard waste, household waste, street sweepings and non hazardous solid waste from industries, commercial areas and institutions that include hospitals. Food waste, papers, plastics, metals, rags, glass, sanitation residue and demolition as well as

construction debris such as rubbles are also classified under this category. The collection of this category of waste is usually done by the Local Authority which has that mandate as enshrined in the Urban Councils Act. The amount of municipal solid waste is mainly influenced by rapid urbanization and changes in lifestyle and consumption patterns. The Global Waste Management Market Report of 2007 revealed that an estimated 2.02 billion tonnes of municipal solid waste was globally generated and this amount represented a 7 % annual increase since 2003.According to UNEP (2009) the global municipal waste generation was projected to increase by 37.3% between 2007 and 2011. EPA (2013) highlighted that cities and towns in India in 1947 generated an estimated 6 million tonnes of solid waste and in 1997 it rose to 48 million tonnes. In Harare about 1.7 million tonnes of municipal solid waste are generated annually and organic waste such as vegetables, fruits, flowers, leaves and kitchen waste constitutes 80 % of the total solid waste quantum (Muza, 2006).The World Bank (1999) highlighted that about 1.5 million tonnes of municipal solid waste are produced daily in the Asian and Pacific Region and it is projected to double by 2025.

2.2.4 Industrial Solid Waste

The World Bank (1999) asserted that industrial solid waste consist of a wide range of components similar to household and waste produced from commercial areas. This is composed of a wide range of materials such as plastics, papers, packaging materials, food waste, solvents, ceramics, rubber, abrasives and metals just to mention a few. Industrial solid waste can be categorized as hazardous or non hazardous in relation to the type of industries and variations in environmental toxicity from the substances produced. Hazardous industrial waste is composed of chemicals and infectious substances generated during production or manufacturing process.EPA (2012) pointed out that various sources of industrial hazardous solid waste include metal, chemical, paper, agro-industrial, dye, refining and rubber industries. Quantifying industrial solid waste is a major challenge facing most Local Authorities in Sub-Saharan Africa and this is attributed to the absence of regularly updated and systematic databases on industrial solid waste which depict the exact rates of waste generation rather than assumptions or approximates used. Hence in this regard, the rates are unknown since the variations in industrial solid waste generation exist between countries at different stages of development.

2.2.5 Hazardous Waste

Hazardous waste refers to the by- products of a wide range of agricultural, industrial, manufacturing processes, nuclear establishments and health care facilities. Tchobanoglous et al (1993) asserted that hazardous waste has potential and substantial hazards on humans and other living organisms. Feresu (2010) pointed out that the generation of hazardous waste is mainly driven by high rates of urbanization and increased economic activities such as manufacturing, mining and agriculture as is the case in Zimbabwe. The major generators of industrial hazardous waste include the chemical, petrochemical, petroleum, metal, wood treatment, leather, textiles, pulp and paper as well as coal fired and nuclear power plants and petroleum production plants. Hazardous waste also originate from small and medium- sized industries which include hospital and health care centres, textile factories, pesticide users and dry cleaners, electroplating and metal finishing shops, auto and equipment repair shops among others. In the Pacific Region, hazardous waste such as waste solvents, chlorine bearing waste, pesticide and organophosphate-herbicide-urea-fungicide bearing waste are extensively used. Nhamo (2005) highlighted that prior 2005 Bulawayo alone produced an estimated 1.5 tonnes of hazardous waste daily but only 0.6 tonnes were collected and disposed at Richmond landfill site. The types, sources and quantities of hazardous waste are greatly influenced by the extent and adversity of industrial activities (Hernandez, 1993, UNEP 1994, UN 1995 and Nelson 1997).

Waste is considered to be hazardous when it is highly inflammable, corrosive, reactive and explosive when exposed to different gases. This is further supported by Hope (1998) who stressed that ignitability, corrosivity, reactivity and toxicity are the unique characteristics of hazardous wastes. Materials such as old batteries, paints, tins, medicinal bottles, old medicines and shoe polish are household waste which can also be categorized as hazardous. EPA (2012) pointed out that hospital waste contaminated by chemicals used in hospitals is considered to be hazardous. This comprises of chemicals such as formaldehyde and phenols used in disinfectants and mercury used in clinical thermometers or blood pressure equipment. Generators of hazardous waste within the industrial sector include metal, chemical, paper, pesticide, dye, refining and rubber industries. Mercury and cyanide can be fatal if one is directly exposed to chemicals contained in hazardous waste.

2.2.6 Agricultural waste

This is waste produced from agricultural production and this result in increased quantities of livestock waste, agricultural crop residues and agro-industrial by-products. Different crop residues are generated from cotton, sugarcane, rice, wheat, maize, mustard stalks, tobacco stalks as well as sunflower stalks, among others. Hoornweg and Thomas (1999) pointed out that various sources of agricultural waste include orchards, vineyards, dairies, feedlots, farms and croplands. In most urban areas of Zimbabwe large quantities of agricultural waste are generated in market places such as Mbare, Sakubva, Egodini and Kudzanai in Harare, Mutare, Bulawayo and Gweru respectively during the rainy season.

2.3 Solid waste management in the developed world

Srinivas (2003) propounded that urban centres in more economically developed countries generate huge quantities of solid waste but adequate facilities and competent institutions for managing their solid waste exist. According to UNEP (2009), less than 10% of the budget is allocated to collection of municipal solid waste in developing countries as compared to the developing countries where 80- 90% of their budget is spend on municipal solid waste collection alone. Research has proven that solid waste that is produced in developed countries is removed and disposed in a safe and efficient manner as evidenced in cities such as Tokyo (Japan), Sydney (Australia), London (England) and New York in the United States of America. UNEP (2002) highlighted that most solid wastes generated in these cities are treated prior to disposal at well chosen, secure and designed landfills. Contrary to this, urban centres in developing countries in the Sub-Saharan Region such as Harare (Zimbabwe) are still in the process of achieving better solid waste management systems since they currently have insufficient solid waste collection and poor disposal systems (Srinivas, 2003).

2.4 Overview of solid waste management in developing countries

Solid waste management in developing countries has become one of the biggest environmental and health concerns in urban centres and in the African region the situation is pathetic in the capital cities where illegal mushrooming dumpsites decorate every corner of the streets. UNEP (2009) articulated that municipalities in developing countries face fiscal challenges to effectively manage their waste from generation up to disposal since 80-90% of their budget accounts for

waste collection only leaving other services in the entire chain of solid waste management not properly attended. In this regard, the local authorities will be incapacitated to provide effective and efficient waste management services. The dire situation is further exacerbated by the indiscriminate dumping of domestic and industrial waste, limited regulation of the private sector and low priority given to solid waste management. Due to the fact that limited financial resources are allocated to the solid waste management sector by central governments service delivery is negatively affected. Feresu (2010) stressed that substantial negative environmental impacts such as pollution in its various forms (air, land and water) and health related problems such as diarrhea, typhoid and cholera have resulted from poor solid waste management practices from its generation to final disposal. World Bank estimates of 2009 highlighted that developing countries spend 20-50% of their available budget on solid waste management but 30-60% of the urban solid waste remain uncollected. Hence, these developing countries face a myriad of challenges in properly managing its solid waste.

The lack of effective legislation, scarcity of human and financial resources in the local authority and irresponsible behavior by residents on wanton littering further aggravates waste management challenges. World Bank (1999) postulated that approximately 0, 5% of per capita gross national product is spent on waste services covering one third of the overall cost in cities of developing nations. The same scholar further propounded that collection costs in low income countries accounts for more than 80% of total waste management costs. In Latin America waste collection costs constitute 46% of the total municipal solid waste management cost. Though there are efforts to implement cost recovery strategies in solid waste management in developing countries they are undermined by lack of willingness to pay for waste disposal. An upsurge in rural to urban migration results in limited access to municipal solid waste management services or no services at all. Laws and regulations have become one of the most prevalent mode of waste management but most developing countries lack vigilance and enforcement capacity to adequately implement this command and control approach. According to Feresu (2010) the failure of legislative frameworks to cascade to local authorities as well as outdated by laws that do not complement the national frameworks make enforcement of legislation and efficient management of solid waste in developing countries poor as it is the case in Zimbabwe.

2.5 Overview of solid waste management in Zimbabwe

Solid waste management in Zimbabwe has become an issue of concern to various stakeholders such as NGOs, government ministries, private sector, corporate sector and the community at large. It is becoming complicated and long-term sustainable initiatives for its solution is a necessity. UN-Habitat (2006) has pointed out that less than 20% of urban solid waste is collected and properly disposed whilst 80% of the waste remains a ticking environmental time bomb in the country. Tasiya (2012) highlighted that uncollected garbage and uncontrolled trading activities have conspired to steal the "sunshine" out of Harare. In Zimbabwe most urban local authorities such as Harare, Bulawayo, Gweru, Chitungwiza and Chinhoyi are grappling with the problems of high volumes of waste, cost involved, disposal technologies and methodologies as well as the adverse effects of the waste on the environment. This challenge has been compounded by the generation of solid waste which has gone beyond the handling capacities of the local authorities especially in the high density area of Mbare. The dire situation is further exacerbated by the irresponsible behavior of residents, economic decline and urban population growth at an unprecedented rate over the last decade. This has placed tremendous pressure on the municipalities.

Practical Action (2007) has reported that waste collection services in Harare have dwindled from 80% of total waste in different local authorities in the mid 1990s down to 30% in cities and towns in the year 2006. About 150 000 tonnes of domestic waste are generated per year and food waste constitute about 70% of the total amount of waste. As a result of the co-disposal method used in waste dumps the bulky of waste is organic and plastics constitute about 20% of the urban solid waste stream (MLGRUD 1995). Extensive integrated waste management programmes are therefore required to reduce the sources and level of waste by establishing domestic recycling and sorting to counteract the challenges bedeviling local authorities. It is against this background that has further inspired the researcher to delve more into community participation in solid waste management so as to come up with some options that may help to improve solid waste management in urban areas of Zimbabwe.

2.6 Urban solid waste disposal practices in Zimbabwe

Bachs (1992) highlighted that about 1.5 million tonnes of industrial waste are produced annually in the urban areas. Approximately 70% of this industrial waste is disposed at 35 legal disposal sites dotted around the country which fail to meet basic environmental standards. Nyashanu (2013) pointed out that the organic waste is mainly responsible for disease outbreaks such as cholera and dysentery. Urban solid waste disposal in Zimbabwe encompasses various methods which are crude dumping, sanitary land filling, open burning, incineration and composting as discussed below.

2.6.1 Sanitary Land filing

Davis and Cornwell (1998) opines that sanitary land filing is an engineered technique of disposing solid waste on land by spreading them in thin layers followed by compacting them to the smallest practical volume before covering them with soil at regular intervals. It is highly recognized as an environmentally and internationally desired technique of solid waste disposal since it minimizes environmental damage and thus eliminating odours. Most disposal sites in Zimbabwe are often categorized as landfills but in technical terms they are not, since soil cover is not regularly applied as per the requirements as is the case with Teviotdale (Pomona) landfill in Harare.Masocha (2004) highlighted that the so-called landfills lack geo-synthetic membranes to prevent groundwater pollution from leachates. It has been widely used as the preferred option for solid waste disposal in large cities such as Harare and Gweru after the realization by the local authorities that crude dumping poses adverse health risks to residents, tends to scare away potential investors and depresses property values.

2.6.2 Incineration

According to UNEP (2002) incineration refers to the combustion or controlled burning of volatile organic matter in sludge and solid waste which reduces the volume of materials while producing heat, dry inorganic ash and gaseous emissions. It is mostly employed in Zimbabwe whereby controlled combustion of solid waste take place in build in chambers at high temperatures to destroy pharmaceutical and medical waste in large referral centres such as Parirenyatwa Group of Hospitals, Harare Hospital, Mater Dei Hospital and Mpilo Hospital in Bulawayo, Gweru Provincial Hospital and Mutare Provincial Hospital among others. The World Bank (1999) articulated that incineration of municipal solid waste reduces the volume and

weight of waste to be landfilled by 90% and 75% respectively though it is costly than the landfill method. However, it contributes to water, air and land pollution when there are inadequate facilities for processing and treating the by-products of combustion as is the case in Zimbabwe. In this vein, it is quite expensive in developing countries due to high investment, operational and maintenance costs involved hence it is least employed**.** Beede and Bloom (1995) propounded that high biodegradability and high moisture content of municipal solid waste make incineration uneconomic if supplementary fuels are not added. Otten (1999) pointed out that over the last two decades incineration has attracted global criticism due to the fact that it generates toxic ash which is harmful to plants and animals.

2.6.3 Open Waste Burning

This method is characterized by simple combustion of solid waste without regulating oxygen and involves non-containment of the combustion-reaction in an enclosed device in order to provide sufficient residence time required for complete combustion. In Zimbabwe this method is predominantly used in low income residential areas where uncollected waste that would have accumulated is set ablaze. It is also prevalent in informal settlements that hardly receive waste collection services from the Local Authority. Masocha (2004) highlighted that in most industrial areas, open waste burning is done by private firms and informal enterprises to destroy solid waste in a bid to avoid payments for the delivery of waste in municipal dumps. In addition to the above, street urchins have also a tendency of burning tyres and cardboard boxes retrieved from skip bins during the winter and under adverse weather conditions. Mangizvo (2008) highlighted that most of the Local Authorities in Zimbabwe burn solid waste materials at dump sites so as to curb the nuisance produced by flying litter as well as reducing the volume of solid waste thus extending the lifespan of the dumps. However, under low temperatures various products resulting from incomplete combustion are produced and these include carbon monoxide (CO) and nitrogen oxides (NO_X) that are health hazard and environmentally unfriendly.

2.6.4 Crude Tipping

This is a rudimentary waste disposal method where wastes are mechanically tipped or dumped and left uncovered in open spaces at designated sites. Johnson (1993) and MLGRUD (1995) highlighted that in Zimbabwe approximately 60 % of solid waste in the urban areas is disposed

using this method. Feresu (2010) posited that this disposal method is widely used by most local authorities in Zimbabwe irregardless of the inherent threats to public health and environmental quality. Examples of waste dumps where crude tipping is done include Richmond in Bulawayo, Pomona in Harare, Phoenix in Bindura, Blue Range in Kadoma, Mvoro in Chegutu and Chinotimba in Victoria Falls (Feresu, 2010). Otten (1999) propounded that from an economic perspective crude dumping is widely considered as the cheapest method of solid waste disposal though from an environmental perspective it is one of the most polluting method. Most Local Authorities in Zimbabwe resort to crude dumping whereby solid wastes are disposed in natural depressions or derelict land, old quarry or abandoned mine pits. In this vein, one can deduce that waste disposal is aimed at achieving land reclamation though there is ineffective separation of waste materials to minimize environmental damage**.** According to Tevera (1991) most open waste dumps in Zimbabwe are major breeding places for mosquitoes, houseflies and rodents when they are attracted by fermenting waste and stagnant water. Hence the waste dumps have been described by Tevera (1993) as vast areas of visual and ecological devastation.

2.6.5 Composting

According to Salvato (1982) composting is the controlled decomposition of solid organic material under warm and moist conditions by the action of micro-organisms such as bacteria and fungi. It is characterized by the pilling and burying of the organic waste till they decompose. Kitshoff (1986) and Mathur (1991) have pointed out that composting underpins the principles of resource conservation whilst at the same time it has minimal environmental damage and economic benefits to households. Most households in Mbare are practicing composting to generate natural fertilizers for use in their backyard gardens and agricultural plots. The quantity of waste to be collected by the urban Local Authority as well as the operational costs is reduced. In consonance with this, the researcher seeks to explore the pivotal role that the community can play towards the sustainable management of solid waste in urban areas which is being taken for granted by urban municipalities.

2.7 Stakeholder participation in solid waste management.

The World Bank (1999) defined stakeholder participation as a process whereby stakeholders with rights, responsibilities and interests proactively participate in decision making and in the consequent activities that affect them. As enunciated in the 1992 Rio Declaration, Principle 10 it

has been stated that to achieve sustainability in environmental issues participation of interested partners at different levels is critical. In this regard, the responsibilities, interests and power structures involved in solid waste management should be highly recognized. Squires (2006) has highlighted that at national level, individuals should have the opportunity to participate in decision making processes on solid waste management but in Zimbabwe minimal participation of the communities exists due to obsolete policies that do not clearly stipulate their roles in waste management which in this case requires urgent attention and redress. The Rio Principle therefore laid the basis for Agenda 21 which makes stakeholder participation in solid waste management inevitable.

The rationale for effective stakeholder involvement is based on the premise that every individual generates waste and can be directly and indirectly affected by poor solid waste management practices. Hence, everyone has a role to play to ensure a safe and clean environment. Makwara (2011) suggested that the effectiveness of municipal solid waste management systems depend on meaningful participation of various stakeholders such as governments, NGOs, corporate sector, private sector, municipalities, industrialists, individuals and the communities among others. Masunda (2013) cited in the Daily News dated 15 March 2013 that full cooperation and coordinated efforts between the aforementioned stakeholders enhance sustainability of solid waste management systems through sharing of responsibilities. The major stakeholders involved in solid waste management are discussed below.

2.7.1 Private Sector Participation

The private sector is one of the stakeholders that play a crucial role in municipal solid waste management in many countries worldwide. A wide range of solid waste management activities are undertaken by private firms, enterprises and companies and these include waste collection, provision of receptacles, street cleaning equipment and financial resources. In Nepal the private sector mostly participate in door to door collection, street sweeping and waste transfer. As a result of this, garbage collection is found to be more efficient and cost effective thereby lessening financial burden on Kathmandu Municipality responsible for waste collection services (Glawe et al. 2000).Proudly Zimbabwean Foundation (2013) pointed out that in Zimbabwe particularly in Harare private organizations such as African Banking Corporation, Vineyard Funeral Assurance, Delta Corporation, Econet, Petrecozim, Nyaradzo Funeral Assurance and Nestle just to mention

a few, have joined together to establish the Bin It Campaign which is a noble project meant to retain the Sunshine Status of the City of Harare. They provide financial assistance for the procurement of refuse collection vehicles, litter bins and street cleaning equipment. Private waste collectors may be directly contracted by individual households, business organizations and the local authority and this is the case in Harare where private waste collectors such as Waste Away, Skip It and Friendly Environmental Services are engaged in waste management services. Gourlay (1992) highlighted that for privatization to be successful proper regulatory structures are needed so that private service providers do not violate environmental guidelines widely accepted for proper solid waste disposal. Transparency, competition and accountability also determine the success of privatization in solid waste management.

2.7.2 Non Governmental Organisations (NGOs)

According to Ali and Snell (1999) non -governmental organisations are secondary stakeholders that play a crucial role in solid waste management through working with the Local Authorities and increasing the capacity of the communities in solid waste management. The major roles of the NGOs include capacity building, provision of cleaning equipment, funds, receptacles, protective clothing and information dissemination thus conscietising residents on the socio-economic benefits of solid waste and the harmful imprints associated with poor solid waste management. Glawe et al (2000) and Nyachhyon (2004) articulated that in the Caribbean Islands particularly in Nepal, a non-governmental organisation known as Zero Waste Nepal (ZWN) works with communities in solid waste management through the application of the Zero Waste Concept that encourages waste segregation at source, recycling and advocating for behavioural change towards proper waste handling. Schubeler (1996) however stressed that non-governmental organisations are primarily motivated by humanitarian or developmental concerns rather than an improvement. In Zimbabwe, non-governmental organisations such as Practical Action, Oxfam, Environment Africa and Zimbabwe Ahead are working with the communities and Local Authorities in Harare and Mutare respectively. They offer support in clean up campaigns, composting and education awareness programmes in the high density residential areas so as to make communities valuable partners of the government in local waste management.

2.7.3 Local Authorities

According to Jerie (2006), Section 83 of the Public Health Act of Zimbabwe of 1996 states that every local authority is mandated to take all lawful, necessary and reasonably practical measures to maintain clean and sanitary conditions in its district at all times so as to prevent accumulation of waste which may be hazardous to health. Local authorities are responsible for solid waste collection, street cleaning services, cleansing inspection, issuance of waste disposal permits as well as waste disposal services in the urban areas under their jurisdiction as enshrined in the Urban Councils Act. In addition to this, Schubeler (1996) and Feresu (2010) stated that local authorities are responsible for administering municipal by-laws that help them to control and regulate activities in their areas of jurisdiction so as to enhance environmental health and protection. Hope (1998) and Mangizvo (2008) asserted that in most developing countries the Local Authorities' capacity to deliver services expeditiously is greatly hampered by financial constraints, weak technical and administrative capacity, and inappropriate technologies in solid waste management and limited resources which are not commensurate with the high rate of waste generation. In Zimbabwe the Urban Councils Act (Chapter 29:15) does not fully embrace the rights of citizens to participate and it is therefore pertinent to note that review of the Acts has to be undertaken so as to include their views and contributions thus covering the current gaps affecting full community participation in solid waste management.

2.7.4 Community Participation

Ali and Snell (1999) propounded that communities are primary stakeholders that are directly affected either positively or negatively by the implementation of a solid waste management project and it includes householders and residents receiving waste management services. While community participation is not a new phenomenon, emphasis is on conscietising decision makers that community participation in solid waste management would add value and reduce costs and risks associated with poor solid waste management practices as they are the key factors for sustainable solid waste management. Yap (1999) highlighted that literature on solid waste management in African countries is scanty and very little is known on the contribution of the community as a valuable resource in solid waste management. In Zimbabwe very little information has been explored in the mix of community participation in alleviating solid waste management problems affecting high density areas as compared to developed countries which have developed waste management systems. In this regard gaps exist in the detailed

documentation of the real projects undertaken by the communities, challenges encountered, suggested solutions as well as the impacts of the suggested solutions which are dealt with in a superficial and piece-meal fashion in developing countries. Community participation in solid waste management therefore involves a wide range of activities that take into consideration the views and aspirations of people who are directly affected through negotiations, planning, discussions and debates.

This is a bottom-up approach which regards communities as the best judges of their own vulnerability capable of making the best decisions regarding their own well being. Hope (1998) suggested that the involvement of vulnerable people themselves in planning and implementation of essential systems is critical. This is attributed to the fact that community involvement in programmes which are aimed at protecting the environment enhances their self esteem and sense of community ownership. According to Mansoor and Saywell (1995) participation of the community in solid waste management exhibits proper sanitation behaviour and their consultation brings administration and management of waste management services to fruition. In this regard, the local community should be taken as the primary focus of attention in solid waste management since they are the immediate victims of the adverse effects of uncollected decomposing garbage. They have best knowledge of their local surroundings in terms of demography of their community and their social and traditional organization and their involvement gives them great confidence in their capabilities to act in the event of disaster.

Schubeler (2006), Makwara and Magudu (2011) concur that this bottom-up approach forms the basis of the decentralization process in solid waste management and its effectiveness depends on flexibility, efficiency and responsiveness to local requirements and potentials. Participation makes communities more receptive of modern knowledge and information presented to them. It is therefore imperative to involve the community by carrying out community based solid waste management education and awareness programmes so as to raise awareness and share knowledge to cultivate values, skills and behaviour among those who are consistent with sustainable environment management. Figueroa (1995) stressed that the community is an indispensable asset as well as a store of social capital since its participation contributes to people's empowerment to possess physical safety, access to control of resources, participate in decision making processes that affect their personal life to enjoy the benefits of a healthy environment. Therefore,

embracing community based waste management models by all stakeholders of solid waste management will assist in the alleviation of solid waste management problems as communities themselves are drivers of their own change and can be masters of their own destiny.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter outlines the various methods that were employed by the researcher to collect and analyse raw data. Qualitative and quantitative research paradigms were used. Field survey methods were also used to gather data and these include questionnaires, observations and interviews. Questionnaires and interviews complemented each other where certain subjects preferred formal discussions. Interviews therefore allowed the researcher to capture unsolicited information which was critical and relevant to the study.

3.1 Research Design

Selltiz et al. (1981) defined research design as the practical way in which a research is conducted according to a systematic attempt to generate evidence that answers the research question. Trochim et al (1982) share these same sentiments as they defined research design as a strategy that integrates the different components of the research project in a cohesive and coherent way.

The descriptive research design was used in this research. Key (1997) proposed that this research method is employed to obtain information pertaining to the current status of the phenomena under study in order to describe what exists on the ground. It is concerned with relationships or conditions that exist, opinions held, processes going on as well as effects that are evident. This descriptive paradigm employed the qualitative and quantitative research design (Triangulation).Triangulation is an approach to research that uses a combination of more than one research strategy in a single investigation to balance them so that each counterbalances the margin of error in the other so as to assure completeness of findings or to confirm (validate) the results (Green *et al*. 1989).

Qualitative research model which is narrative in nature was used by the researcher to gain a deeper understanding of people's views, opinions and interpretations pertaining to the role and effectiveness of communities in solid waste management focusing on the insider view since reality is subjective. The qualitative research allowed the researcher to get data on the roles and activities undertaken by the residents, community health clubs and waste recycling cooperatives in Mbare (Nenyere) as far as solid waste management is concerned. First hand information on community participation in solid waste management was obtained from The Local Authority,

Practical Action, Oxfam, Environment Africa, Environmental Management Agency, Zimbabwe Environmental Law Association, St Peters Church, Tisunungureiwo Recycling Cooperative and selected residents involved in solid waste management in Mbare. Moreso, community health clubs such as Anotidaishe, Jabulisa and Zeza Tsvina who are involved in solid waste management in Nenyere Flats through the Water, Sanitation and Hygiene projects (WASH) were interviewed by the researcher to get detailed information on the activities they undertake and challenges affecting them. In this regard, a holistic, total and complete picture of the prevailing situation was established. The use of questionnaires, photos, observations, interviews, existing information and statistical analysis under this research model assisted the researcher to unearth what is currently on the ground.

The quantitative research model was also used in this research basing on the premise that social phenomena can be quantified, measured and expressed numerically thereby making the data liable to be analysed by statistical methods. Crawford (1990) highlighted that the quantitative method is mainly focused on the collection and analysis of numerical data and statistics. Key (1997) suggested that the quantitative research model involves the counting and measuring of events and assumes that there is an objective truth existing in the world that can be measured and explained scientifically. This enabled the description of social structures that are not directly observable. Quantitative information on the amount of waste generated at household level in Mbare (Nenyere), statistical tests, effectiveness of community participation and perceptions of the respondents towards community participation, sustainable waste management strategies and legal aspects was vital in the production of statistical tables, frequency tables, graphs and charts that represented the research findings.

3.3 Target Population

Crawford (1990) defined target population as the entire set of units for which a survey data is to be used to make inferences. This is therefore the entire aggregation of respondents that meet the designated set of criteria. This total group of people or objects helps the researcher in generalizing a conclusion. Nenyere was purposively selected by the researcher based on the premise that it is undertaking solid waste management pilot projects at community level initiated by non-governmental organisations under the Water, Sanitation and Hygiene programme (WASH) and Urban Environment Programme aimed at empowering communities through their

participation in solid waste management activities. This research was targeted on community based groups such as Tisunungureiwo Recycling Cooperative, Zeza Tsvina, Anotidaishe and Jabulisa Community Health Clubs in Mbare (Nenyere) which are involved in solid waste management through waste recycling activities, waste sorting and collection. The researcher's intention was to assess the roles that are currently being undertaken by these community health clubs and recycling cooperatives so as to evaluate their effectiveness in improving sanitation and hygiene in Nenyere and also in fulfilling the objectives of the WASH Programme. Nenyere residents involved in waste collection, reuse and participation in clean up campaigns were also included. Various solid waste management practices used by these groups were explored and thus revealed their contribution in solid waste management in Mbare. Selected residents also aired their sentiments on the involvement of communities in solid waste management issues through focus group discussions and completion of questionnaires issued to them by the researcher.

The Local Authority particularly the City of Harare, Waste Management Department was a target group that gave its views, perceptions and evidence on the topical issue of solid waste management in Mbare since the residential area is under its jurisdiction. By that virtue, all activities done in Mbare have to be known by the local authority. The researcher undertook semi-structured interviews with the Operations Manager from the Waste Management Department. Information on the roles and effectiveness of the residents, community health clubs and recycling cooperatives in solid waste management was extracted from this key informant.

Non - governmental organizations involved in providing technical and financial assistance to communities and the local authority in solid waste management operations in Harare such as Oxfam, Practical Action and Environment Africa were consulted by the researcher to get information pertaining to community involvement in solid waste management, challenges encountered, sound solid waste management practices to adopt and legal aspects affecting community participation. In addition to the mentioned organisations, Zimbabwe Environmental Law Association (ZELA) and Environmental Management Agency which are legal institutions respectively involved in advocacy, spearheading clean up campaigns in Mbare and educating the residents on legal issues related to solid waste management were also consulted by the researcher in order to obtain solid evidence on the legal aspects affecting participation of residents,

community based organisations as well as the impacts of community participation in solid waste management. From the target groups alluded above, information obtained assisted the researcher to make inferences and generalize conclusions.

3.4 Sample Size Determination and Selection

In sample size determination 10% of the population was chosen to represent the population under study. By preferably using 10% of the population reliability and validity of the study was enhanced and thus determined the extent to which recorded observations reflected the construct they were intended to measure. A proportion of 10% is widely accepted when dealing with a given population which is above 100.This assisted the researcher in saving time and resources available for data collection since the research was self funded. Accuracy and truthfulness of the results representing the participation of the community in solid waste management in Mbare was achieved.

In selecting a sample, the purposive sampling technique was used to obtain information from specific people who would best answer the issues at hand towards fulfilling the research objectives using the researcher's own judgement. Judgemental sampling was used to get specific information from the community health clubs, recycling cooperative, local authority, Oxfam, Practical Action, Zimbabwe Environmental Law Association, Environmental Management Agency, St Peters Church and Environment Africa. In this regard, purposive sampling was critical since it is based on the knowledge of the population and the purpose of the study. A better understanding of the more regular patterns of behavior therefore required purposive sampling.

3.5 Sampling Procedures

In selecting residents during data collection systematic random sampling technique was used to extract a representative sample of the community to get the required information. Systematic sampling was used to select 100 houses from the 10 blocks that constitute Nenyere Flats with 1000 households for questionnaire distribution. This sampling technique relies on arranging the target population according to an ordering scheme followed by selecting elements at regular intervals basing on that ordered list (Albandoz and Barreiro 2001).Systematic Sampling is characterized by a random start and then proceeds with the selection of a k $\square^{h}$ time (Population Size divided by Sample size).In this case it was 1000/100 = 10.The starting point was randomly

selected provided the house was in Nenyere. Questionnaires were distributed on every 10th house until the 100 houses were completed. Every house in the sampled area had an equal probability of being selected using this systematic sampling method and this provided the most valid and credible results that reflected the characteristics of the population from which they are selected.

3.6 Procedures for data collection

Questionnaires, Interviews and photos were used to collect primary data and secondary data was collected through desktop research. Questionnaires were self administered to the 100 systematically selected houses in Nenyere area in order to make sure that all questions were answered and to assist in areas that required the researcher's attention. Formal interviews were conducted on the key informants such as Project Coordinators from Oxfam, Practical Action, Environmental Africa, and Operations Manager from the Waste Management Department and Environmental Officers from EMA, ZELA Director and Chairpersons of Zeza Tsvina, Anotidaishe and Jabulisa Community Health Clubs among other selected key informants of organizations mentioned earlier.

3.6.1 Questionnaires

A total of 100 questionnaires were self administered to 100 systematically selected households (target population) to obtain adequate information from residents on solid waste types generated at household level, generation rates, solid waste management activities undertaken by the community, effectiveness of community participation, environmentally sustainable solid waste management practices as well as legal and institutional aspects involved in solid waste management. The questionnaires keep away from interviewer bias, guiding the areas that can impact the legitimacy and reliability of data collection. They comprised of closed type questions whereby answers to the questions were availed and open ended type questions which gave room for respondents to explain and describe their feelings about the issues requiring clarification.

Open ended questions allowed the respondents to formulate their own answers as far as solid waste management is concerned particularly looking at the roles undertaken by the residents and community based groups in solid waste management. Closed ended questions entailed the respondents to choose answers from given options. The questionnaires are of critical importance in research since the research study can be swiftly done and data analysis can begin right away and they are a less costly way of reaching people. As suggested by Milne (1999) questionnaires

allowed responses to be gathered in a standardised way and in this case the questionnaires were more objective. Thus, through the use of questionnaires (Appendix 3.1) potential information was collected from a large portion of a group.

3.6.2 Interviews

Interviews were also important in this research study. They were used to gather the experiences of the research subjects based on questions prepared by the researcher. Semi-structured interviews were used to extract information from key informants selected from 3 Community Health Clubs in Nenyere (Anotidaishe, Jabulisa and Zeza Tsvina) and Tisunungureiwo Recycling Cooperative, City of Harare Waste Management Department, Oxfam, Practical Action, Zimbabwe Environmental Law Association (ZELA), Environmental Management Agency (EMA), Environment Africa, and St Peters Church. The structured interviews allowed the researcher to get specific data through asking questions that gave the researcher room to probe the ideas and perceptions of the respondents about the phenomenon of interest. Gilbert (1990) postulated that interviews allow the researcher to get an insight into the lives of the subjects, thereby allowing the interviewer to gain access into their world as well as their perception on solid waste management practices done in Mbare and the impacts of community participation. The key informants are shown in Table 3.1 below.

Table 3.1 shows key informants interviewed and reasons for their selection.

Key Informants	**Reasons for Selection**
City Of Harare Waste Management Operations Manager (Appendix 3.5)	Responsible for the day to day management of waste management services in Harare.
Oxfam, Mbare Project Officer (Appendix 3.2)	Grants financial assistance to Community Based Groups so as to purchase all the required materials for various solid waste management projects on behalf of the Waste Management Groups.
Practical Action Project Officer (Appendix 3.3)	Involved in fostering community managed models in waste management, giving financial assistance to the community as well as

	promoting service delivery and income generating projects with Community Based Organisations.
Environmental Management Agency Project Officer (Appendix 3.4)	Responsible for coordinating environmental protection activities by giving knowledge and understanding of environmental rights, legal procedures and relevant Statutory Instruments and Regulations to different stakeholders.
ZELA Director (Appendix 3.9)	Responsible for empowering community based waste management groups to exist as legal entities capable of transacting and negotiating business deals with the public and private sector. - He develops the legal capacity and improves the advocacy capability of waste management groups.
Environment Africa Project Officer (Appendix 3.7)	Promoting awareness of the Environmental Law among communities and to capacitate the community groups to use the law to protect and enforce their rights.
St Peter's Church Warden (Appendix 3.6)	Mobilizing the community in waste management activities aimed at keeping the environment clean.
Tisunungureiwo Recycling Cooperative Director (Appendix 3.8)	Involved in the recycling of solid waste in Nenyere, Mbare.
Zeza Tsvina, Anotidaishe and Jabulisa Community Health Clubs Chairpersons (Appendix 3.10)	They are responsible for day to day running of solid waste management projects within their groups in Nenyere.

3.6.3 Observations

This non verbal way of collecting data was used by the researcher. It emphasizes on discovering the meanings of the reactions exhibited by people towards actions of other people or change of situations. It allowed the researcher to look at people's actions and situations noting what is going on without asking questions. In the case of the research under study, observations assisted the researcher to view day to day solid waste management activities that were undertaken by community groups and residents in Mbare (Nenyere).Activities taking place at cooperative recycling points were also observed by the researcher and thus revealed the ways communities are involved in solid waste management.

3.6.4 Focus Group Discussions

They also made an important contribution to the research study. Well facilitated and organised group discussions were held by the researcher with residents and representatives from the Local Authority such as Cleansing Inspectors, Cleansing Superintendent and the Hazardous Waste Officer. They assisted the researcher in bringing to the surface various activities undertaken by communities, challenges affecting their full participation, solid waste disposal practices employed by residents at household level, and environmentally sustainable solid waste management strategies that must be adopted at community and national level. The discussion also allowed the researcher to probe more questions during discussions. In this regard, the effectiveness of community participation was assessed and it paved way for the researcher to find recommendations and solutions that must be taken aboard to ameliorate solid waste management problems affecting high density residential areas.

3.6.5 Desktop Research

Desktop research was also used in this research study. Secondary data collection methods including document review were employed. Studying of existing literature on stakeholder interventions such as community participation in maintaining a delicate balance between solid waste management and environmental quality was imperative in giving the researcher critical information on the best solid waste management initiatives being used. The existing literature included journals, annual reports from organisations, institutions and individuals interested in solid waste management issues, magazines, websites, memos, published books, newspapers and institutional presses. These pieces of literature gave a detailed account of solid waste

management practices being implemented in both developed and developing countries at regional, national, local and community levels with emphasis on community involvement in solid waste management.

3.7 Data Analysis and Presentation

Upon completion of data collection process the researcher undertook an interpretation exercise of the research findings so as derive the meaning of the results. This study consisted of both qualitative and quantitative data which was presented and analysed differently. Quantitative or numerical data extracted from questionnaire and interview responses was analysed using the Statistical Package for Social Sciences (SPSS) and data presentation was done using various tables, charts, graphs and figures. Microsoft Excel was also essential in the production of other graphs. Significance tests for different variables were done using parametric tests such as Pearson Product Correlation and Chi Squared which is a non parametric test. Regression analysis was also critical in establishing the relationship between household size and quantity of solid waste generated using SPSS. Thus SPSS was critical in data coding and analysis of data from the respondents. By that virtue, SPPS saved time and reduced the researchers efforts in constructing graphs based on the available data.

Descriptive statistics also played a significant role in generating percentages and statistics of respondents. Interviews, photographs and document review generated qualitative or narrative data that described and explained the different activities that are being undertaken by the community in Nenyere (Mbare) on solid waste management. It is therefore pertinent to understand that brief summaries, published data, documents and reports were vital to the researcher as evaluation data. In consonance with this, findings from the research study which include socio-demographic information, waste collection and generation rates, activities undertaken at community level, legislative aspects and sustainable solid waste management practices and options as well as the effectiveness of community participation in solid waste management in Mbare were presented through the use of tables, graphs, pie charts and the significance of each illustration was briefly explained.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the research findings. The data collected from conducted interviews and administered questionnaires was analyzed and interpreted to derive meaning from the findings. During data presentation the researcher focused on the objectives of the study so as to analyse and interpret the results in line with the research objectives.

4.1 Socio-Demographic information of respondents

The researcher administered 100 questionnaires to the Nenyere residents to solicit data on solid waste types, generation, nature and extent of community participation, perceptions on environmentally sustainable solid waste management strategies as well as legislation and institutional aspects and the response rate was 100%.The results showing the socio-demographic characteristics of respondents which comprise gender, age, occupation, and household size were obtained from the 100 administered questionnaires. The results revealed that 60% of the respondents in Nenyere Blocks (Mbare) were females and 40% were males. This can be attributed to the fact that men often hold decision making and technical positions at sanitation service delivery level whilst health and hygiene at the household levels are usually seen as women's concerns. Figure 4.1 below shows the sex of the respondents.

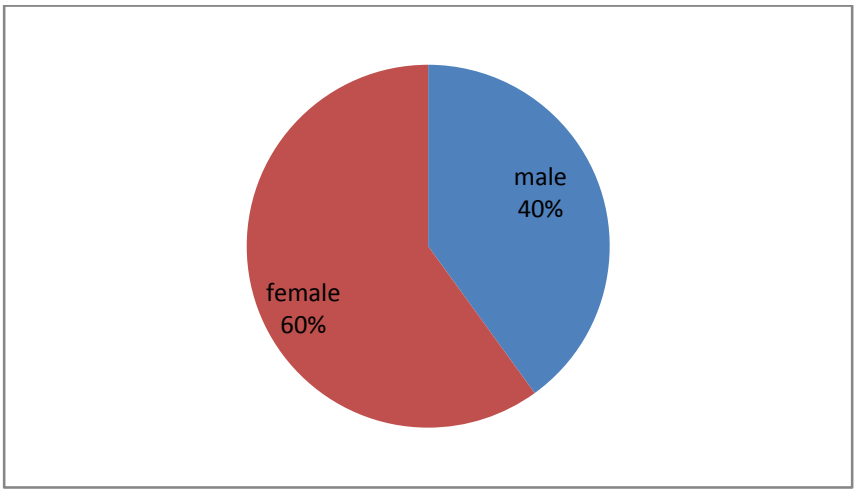

Figure 4.1 Sex of respondents who participated in questionnaire filling.

Dornyei (2007) posited that the response rate of between 75% - 100% can be used to justify the authenticity of the results. Hence in this regard the response rate alluded above shows that the results will be considered authentic and valid.

Findings from the administered questionnaires depict that the most dominant age group is the 19-28 years category which constitutes 30% followed by the 29-39 years, 40-50 years, 51-60 years, below 18 years and the 62+ categories as shown in Fig 4.2 below.

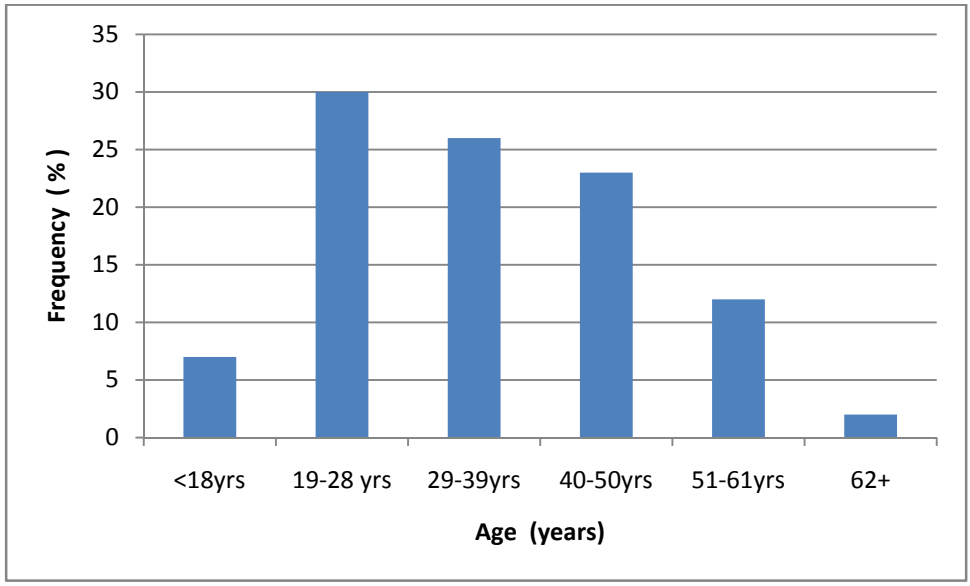

Figure 4.2 Age distribution of respondents

Another socio-demographic characteristic of significance is household size which is one of the major determinants of solid waste generation at household level. The quantity of solid waste generation depends on the size of household. As the number of persons in the household increases so does the amount of waste produced by the household to increase. This notion is buttressed by Jones et.al (2008) who propounded that there is a positive correlation between household size and the amount of waste generated.

Table 4.1 Summary of household size frequencies

Household size	Frequency	Percentage
1-3	20	20
4-6	48	48
7+	32	32
Total	100	100

Source: Field Survey conducted (2014)

The sex of respondents, marital status and employment status of the respondents was also another socio-demographic information that was considered by the researcher and the results obtained were cross tabulated in Table 4.2 below

Table 4.2 Cross tabulation of gender, marital status and employment status of respondents.

	Marital Status			Employment Status			
	Single	Married	Total %	Yes	No	Self employed	Total %
Sex : Male	12	28	40	15	12	20	47
Female	20	40	60	10	21	22	53
Total	32	68	100	25	33	42	100

Source: Field Survey, 2014

From table 4.2, it can be noted that 15% of the males and 10% of the females are formally employed whereas 20% of the males are unemployed and 22% of females are also unemployed. The self employed category constitutes the highest proportion of 42% with 20% and 22% representing males and females respectively. Those who are self employed eke their living by undertaking various economic activities in the informal industries dotted around Mbare.

The educational level or educational attainment of respondents was also another crucial socio-demographic data solicited by the researcher in order to get information on their knowledge and understanding of solid waste management issues that affect them either positively or negatively. The results are presented in figure 4.3 below.

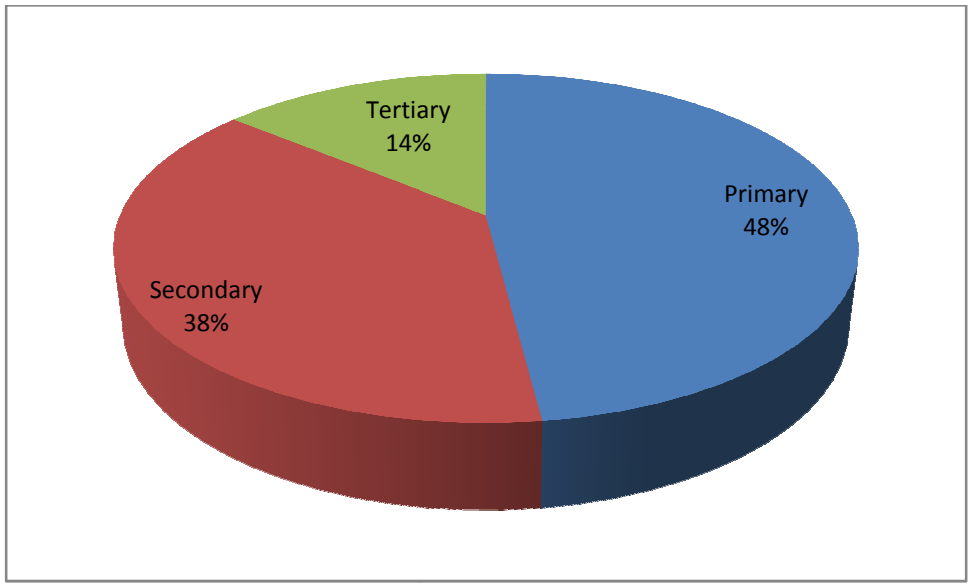

Figure 4.3 Educational levels of respondents

Figure 4.3 reflect that 48% of the respondents attained primary education whilst 38% and 14% attained secondary and tertiary education (college or university) respectively. Educational attainment of respondents determined the different levels of understanding as well as perceptions and attitudes of individuals on solid waste management issues. The highest proportion of 48% representing primary education obtained by the residents has a negative impact on the perceptions, understanding and attitude of residents on different aspects involved in solid waste management.

4.3 Types and amount of solid waste generated at household level

Various types of solid waste are generated at household level in varying quantities. These variations can be attributed to various household factors such as household size, income levels, age and consumption patterns to mention just a few. Organic waste which is highly biodegradable consist of food/vegetable waste, yard waste, paper, plastics, diapers and inorganic wastes which are non-biodegradable such as glass, metals and cans are the common types of solid waste generated at household level in Mbare. Though this is the situation at hand, the quantity of each category could not be easily established since the solid waste is commingled during storage. However, the quantity of solid waste generated was derived from the storage facilities used by the households which are the 50kg plastic bags provided by the local authority followed by emptying the contents and manually sorting the waste into groups then weighed

them to find the mass of each category generated per week. The physical composition of the solid waste and percentage mass generated per week is shown in Table 4.3 below.

Table 4.3 Solid waste types and weekly generation rates.

Type of solid waste/ Component	Weekly generation (% mass)
Organic	
Food waste	28
Paper	6
Plastics	11
Yard waste	16
Diapers	15
Textile	4
Inorganic	
Metals	8
Glass	2
Cans	4
Miscellaneous	6
Total	100

Based on the analysis of the waste stream the researcher discovered that organic waste dominated the solid waste stream with food waste constituting 28%, paper 6%, plastics 11%, yard waste 16 %, diapers 15% and textile 4%. Inorganic waste is also generated at household level but in small quantities and consisted of metals 8%, glass 2%, cans 4% and miscellaneous 6%. These statistics are based on responses obtained from the 100 administered questionnaires as well as interviews conducted by the researcher. These results concurred with sentiments echoed by the City of Harare Waste Management Department Operations Manager. He said "*Domestic or household waste is mostly dominated by organic waste comprised of food waste, vegetable and fruit wastes, plastics, papers and yard waste depending on the season of the year, consumption patterns and household size.*" The amount of solid waste generated weekly varied

per each household depending on the household composition. Statistical results obtained from the research revealed that quantities of solid waste generated range from as low as 10kg to a maximum of 100kg per week. As alluded before, the varying amounts of solid waste generated were determined by the household size. Evidence from the study has proven that few people per household that is 1-3 people tend to generate little waste of about 10 kilogrammes per week and as the household size increases from 4 people to more than 7 people per household, so does the amount of solid waste to increase. A household of 4-6 people generated 50-60 kilogrammes of waste per week and more than 7 people per household generated a maximum of 100 kilogrammes per week.

Figure 4.4 Statistical analysis of solid waste generated and percentage generation.

Descriptive statistics were used by the researcher to determine statistical co-relationships that exist between household size and quantity of waste generated using the Regression analysis as shown below.

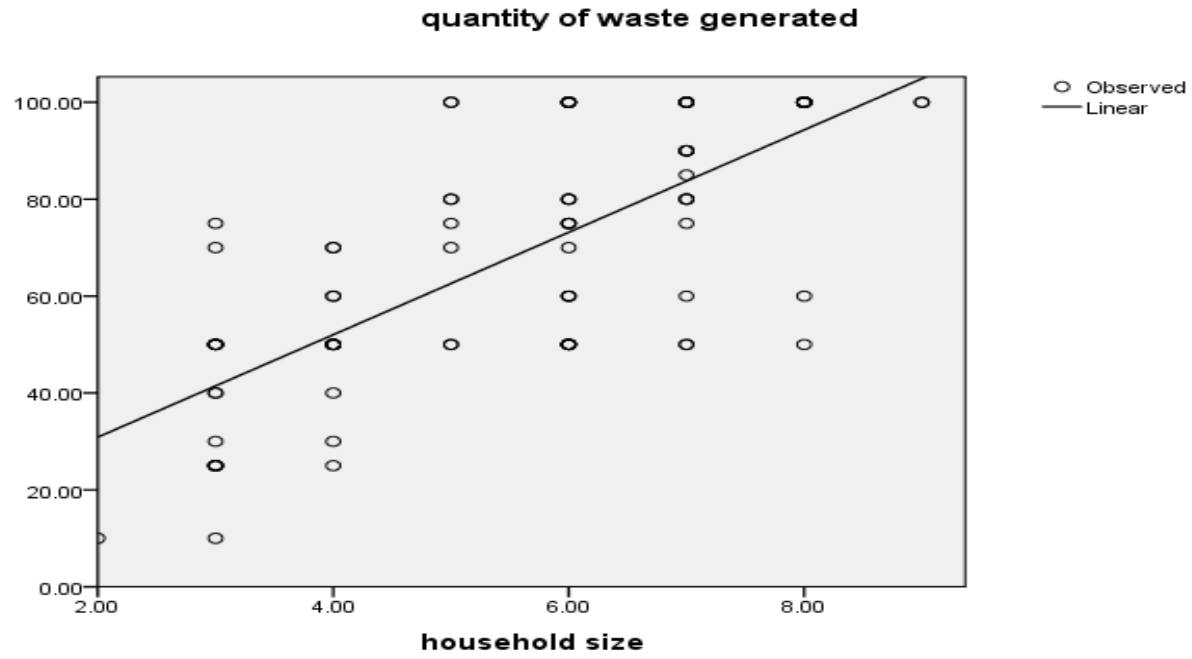

Figure 4.4 Regression analysis of the relationship between household size and amount of waste generated at household level.

From Figure 4.4 it can be noted that as the household size increases so does the amount of waste generated to increase which concurs with the view of Jones et al (2008) who asserted that the amount of solid waste generated at household level increases as the household size increase. Pearson Product Moment Correlation Co-efficient was also a statistical test used by the researcher to determine the relationship between household size and quantity of waste generated at household level. Results of this significance test were analyzed using the Statistical Package for Social Sciences (SPSS) as tabulated below.

Table 4.4 Pearson Correlation showing relationship between household size and quantity of waste generated.

Correlations

		household size	quantity of waste generated
household size	Pearson Correlation	1	.739**
	Sig. (2-tailed)		.000
	N	100	100
quantity of waste generated	Pearson Correlation	.739**	1
	Sig. (2-tailed)	.000	
	N	100	100

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

From Table 4.4 above, the researcher noted that at 99% confidence level a strong positive correlation of 0,739 is obtained and in this regard one rejects H_0 (there is no relationship between household size and quantity of waste generated) and accepts H_1. By accepting H_1 it is indicative of the fact that there is significant positive correlation between household size and quantity of waste generated at household level.

4.3.1 Storage facilities and frequency of collection

Evidence from questionnaires and interviews has shown that storage facilities for solid waste generated at household level are provided by the Local Authority. As enshrined in the Urban Councils Act Chapter 29:15 it is the responsibility of the local authority to undertake solid waste management activities such as provision of receptacles, collection, transportation and disposal of solid waste in areas under its jurisdiction. The main storage facilities are the 50 kg plastic bags provided by the local authority which must be supplied to each household on a weekly basis but currently this is not the case in Mbare. The solid waste is commingled or commixed in one plastic bag irregardless of the type of waste generated. This is supported by the responses obtained from the interview conducted by the researcher with the Operations Manager of City of Harare, Waste Management Department who pointed out that the local authority is incapacitated to provide receptacles for each type of solid waste at the sources of generation and by that virtue residents are left with no option besides mixing the solid waste in one plastic bag.

From the administered questionnaires it was noted from the responses that the local authority collect solid waste once per week on a door to door basis (curbside collection) and sometimes there are no collections at all due to various reasons. These include shortage of fuel for refuse collection trucks, malfunctioning of refuse collection fleet and mischievous behavior by the waste collection crew which is sometimes unreliable in collecting waste in their respective areas. They deliberately leave some areas unattended. The frequency of collection is low considering the fact that Mbare is a high density area characterized by the ballooning of population caused by rural-urban migration. In line with this, the storage facilities as well as the frequency of collection are not commensurate with the rate of solid waste generated by different households. Such erratic collection of waste results in indiscriminate dumping of solid waste at undesignated places.

4.3.2 Disposal methods

The disposal of solid waste in residential areas remains one the biggest challenges affecting the local authorities, aesthetic quality of the urban environment and it is one of the catalysts for disease outbreaks. Rudimentary solid waste disposal methods are employed by the residents in Nenyere (Mbare).Evidence from the research study has revealed that open dumping, backyard incineration, open pits, composting and weekly collections by the local authority are the common

methods used by the residents in order to get rid of the bulky solid waste from their premises. The illegal solid waste disposal practices are attributed to the poor service delivery by the local authority as reflected by the low frequency of waste collection. Attitudinal behavior of residents also play a crucial role in poor solid waste disposal when they throw away or burn waste willy-nilly without the knowledge of the harmful imprints likely to be caused by these waste disposal strategies that are environmentally unfriendly. The disposal methods identified by the respondents are shown below in Table 4.5

Table 4.5 Solid waste disposal methods used by residents in Nenyere, Mbare

Disposal Method	**Frequency of respondents**	**% frequency of respondents**
Open space dumping	20	20
Backyard Incineration	15	15
Open pits	4	4
Composting	10	10
Weekly collections by local authority	51	51
Total	100	100

Table 4.5 shows that various solid waste disposal methods are employed by the residents. These include open space dumping which constitute 20%, backyard incineration with 15%, open pits with 4%, composting and weekly collections by the local authority with 10% and 51% respectively. Open space dumping and backyard incineration are practiced by the residents when the local authority fails to collect waste on time and when the residents miss the collection schedules. The illegal disposal methods are exacerbated by the so-called "Not-in-my-backyard" syndrome (NIMBY) where individuals do not want dumpsites in their backyards and therefore dump waste anywhere. As alluded before, attitudinal behaviour and littering culture of residents further compound the dire situation. In this regard, the situation in Nenyere is pathetic as every corner is decorated with heaps of garbage which have become an eyesore and health time bomb.

4.4 Community Participation

This concept of community participation in solid waste management forms the core part of the research study since the researcher intended to scrutinize the roles and effectiveness of community participation in solid waste management in order to come up with sustainable solid waste management options in Mbare.

4.4.1 Solid waste management activities undertaken by the community

The researcher administered questionnaires, engaged in focus group discussions, conducted interviews and captured photos to identify the activities undertaken by the community in solid waste management. This is particularly with reference to the activities undertaken by residents and community based groups which include recycling co-operatives and community health clubs in Nenyere. These activities are clean up campaigns, composting, waste collection and recycling and education awareness as presented in figure 4.5 below.

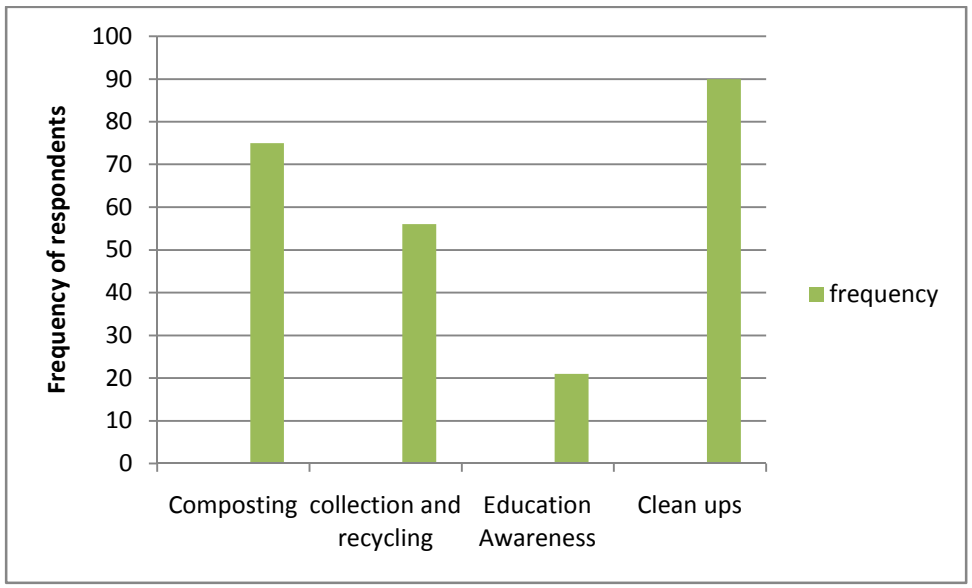

Figure 4.5 Solid waste management activities undertaken by the community in Nenyere.

Figure 4.5 reveals that clean up campaigns are the most dominant activities undertaken by the community on a regular basis as reflected by a frequency of 90 respondents. They are sponsored by Oxfam, Local Authority and the Environmental Management Agency (EMA).The Local Authority is responsible for providing brooms, protective equipment such as masks and refuse removal trucks during the clean up campaigns. Oxfam provides cleaning equipment such as

brooms, shovels, wheelbarrows, T-shirts, bins, pamphlets, and train people on proper solid waste management principles such as presorting as well as food to participants whereas the Environmental Management Agency undertakes education awareness exercises on solid waste management issues during the clean up campaigns. St Peters Catholic Church also plays a significant role in clean up campaigns through mobilizing residents to participate in these special events. Information obtained from the Oxfam project officer revealed that Oxfam assisted the residents in Mbare to establish Community Health Clubs that actively participate in clean up campaigns .Plate 4.1 below shows the community undertaking a clean- up campaign.

Plate 4.1.Community participating in a clean - up campaign in Mbare

From the interviews held between the researcher and the project officers from EMA, Oxfam, Practical Action, St Peter's Catholic Church and the Operations Manager of City of Harare Waste Management Department it was noted that they all subscribe to the view that clean up campaigns promote a sense of community ownership, social cohesion and discourage indiscriminate littering among residents and at the same time they make the environment clean. The interviewees mentioned above also asserted that clean up campaigns are useful tools in solid waste management as they are meant to conscietise residents on the importance of a clean

environment. Clean up campaigns also reinforce Millennium Development Goal 7 (MDG 7), which is aimed at ensuring environmental sustainability.

Composting is also another activity that is being practiced by the community in Nenyere and from the administered questionnaires 75 respondents highlighted that it is one of the emerging solid waste management strategy that has drawn attention of many residents. This is mainly practiced by Community Health Clubs in Nenyere which are Zeza Tsvina, Anotidaishe and Jabulisa Community Health Clubs where these community clubs encourage residents to be proactively involved in composting of organic waste which include vegetable, fruit waste, yard waste and garden waste which is highly biodegradable at their households. From the interviews held by the researcher with Oxfam project officer and Operations Manager of COH, Waste Management Department they highlighted that composting has attracted attention of many residents and this has assisted the local authority as far as service delivery is concerned, thus alleviating the solid waste management challenges bedeviling high density residential areas. Composting has therefore been hailed by the local authority as an environmentally sustainable waste management strategy that should be practiced in almost all high density residential areas. Composting has beneficial effects to the households and the local authority. Households get natural fertilizers for use in their small gardens and plots. Hope (1998) opined that backyard composting is critical when dealing with household organic waste. It is also a source of income to residents when the manure is sold. For municipalities it reduces waste collection and disposal costs and in certain circumstances composting gives municipalities fiscal prospects when they are financially crippled (Hope, 1998).

Results obtained from conducted interviews and administered questionnaires have shown that waste collection and recycling in Mbare have also drawn much attention of residents to an extent that they have established recycling cooperatives in a bid to improve solid waste management services in the urban areas as well as alleviating poverty since it is an income generating activity. In an interview conducted by the researcher with the director of Tisunungureiwo Recycling Cooperative in Nenyere Mbare, she pointed out that they collect various solid wastes ranging from plastic bottles, empty tins and various metals from scavengers and later on sort the waste according to types. Metals, cans and plastics are converted into useful products and they have become a considerable source of income for the residents who are very destitute. This is done on

a daily basis. In an interview the ZELA director and Environment Africa project officer said "*the waste recycling initiative came into effect after the realization that communities can better understand solid waste management issues if they actively participate in solid waste management activities."* They also pointed out that waste recycling is encapsulated in the Urban Environment Programme which is aimed at making purposeful and far reaching contribution to the fight against urban poverty by promoting community participation. Example of recycled products such as guitars, pots and stools are shown in plate 4.2 below.

Plate 4.2 Art products from recycled solid waste. (Source: Environment Africa.)

ZELA as a legal institution assists waste recycling groups to be registered so that they operate as legal entities. The Local Authority also assists the communities in waste recycling by allocating or providing sites for the construction of waste recycling plants. Environment Africa assists communities to venture into recycling business so that they earn a living out of waste. Evidence from the questionnaires revealed that 56 respondents are fully aware of waste recycling though composting and clean up campaigns topple all the activities. However, the director of

Tisunungureiwo Recycling Cooperative pointed out that though they provide collected containers to Delta Beverages, Petrecozim and Lyons more support from stakeholders is highly required as far as markets for their products are concerned since they sometimes spent the whole month with unsold products and in this regard many residents opt for composting and clean up campaigns that have instant benefits.

Education awareness was also acknowledged as a solid waste management activity undertaken in Nenyere area and it constituted 21 respondents. This is due to the fact that EMA and the Local Authority responsible for conducting education awareness undertake education awareness occasionally and not regularly. More educational awareness programmes are usually held in conjunction with clean up campaigns. However, Community Health Clubs alluded above such as Zeza Tsvina, Anotidaishe and Jabulisa periodically undertake education awareness programmes but inadequate training and education awareness techniques hamper them from undertaking regular education awareness programmes.

The researcher deduced that the Water, Sanitation and Hygiene programme (WASH) is a brainchild of Oxfam which is aimed at empowering communities to form Community Health Clubs that proactively participate in solid waste management issues at household and community levels. Chairpersons from Zeza Tsvina, Anotidaishe and Jabulisa health clubs pointed out that in order to evaluate progress and measure performance they conduct household visits to monitor behaviour change among group members in relation to solid waste management.

These activities are supported by various organizations in both technical and financial terms as shown in Table 4.6 below.

Table 4.6 Activities done by the community and supporting organisations.

Community Activities	Supporting Organisations
Clean up campaigns	Oxfam, EMA, Environment Africa, Local Authority
Composting	Oxfam, Practical Action, Local Authority
Waste recycling	ZELA, Local Authority, Environment Africa
Educational Awareness	Environment Africa, EMA, Oxfam

From table 4.6 it can be deduced that various activities shown are supported by different organisations in order to make them more effective as far as planning, implementation and management of solid waste activities in their communities are concerned. Full support from these organisations invigorates the concept of Integrated Solid Waste Management (IWRM) aimed at giving various stakeholders a shared responsibility thereby enhancing sustainable management of solid waste in urban centres.

4.4.2 Effectiveness of community participation in solid waste management

The effectiveness of community participation in solid waste management was determined by the changes or improvements in service delivery and cleanliness of the neighbourhood. Results obtained from interviews showed that communities have been highly acknowledged by various organisations that work with the entire community. In an interview, the Oxfam project officer, said "*Community participation is very effective as reflected by their participation in clean up campaigns. Their attendance is quite high and they have a positive attitude towards a clean environment.*" The ZELA Director also pointed out that community participation is very effective due to the fact that there is active participation by the community groups in solid waste management activities such as recycling to an extent that various stakeholders such as EMA and the Local Authority are fully cooperating with the community which was never done before. He also highlighted that the community is supportive of solid waste management initiatives that are currently in place. Table 4.7 below statistically shows the respondents' perceptions on the effectiveness of community participation in solid waste management.

Table 4.7 Respondents' perception on the effectiveness of community participation in solid waste management

	Effective	Moderate	Very Effective	Satisfactory	Total
Number of Respondents	24	30	45	11	110

Table 4.7 indicate that 45 respondents (41%) appreciate that community participation is very effective in solid waste management activities such as clean up campaigns, waste collection and recycling as well as composting.30 respondents (27%) from the interviews and administered questionnaires pointed out that community participation in solid waste management is moderately effective due to limited support given to residents by supporting organisations whilst 24 respondents (22%) and 11 respondents (10%) stressed that it is effective and satisfactory respectively. By that virtue, the respondents acknowledged community participation as a key tool in solid waste management since it has brought solid waste management initiatives into fruition.

The Operations Manager of the COH, Waste Management department also shared the same sentiments with the interviewees alluded above. He stressed that the community is very effective due to their positive participation in recycling, clean up campaigns, education awareness as well as composting activities that keep their environment clean and in this regard the community has a positive impact as far as sustainability is concerned. In addition to the above, he said "*Initially the community's attitude was that it is the responsibility of the Local Authority to collect waste but with the advent of disease outbreaks such as cholera in 2008 they came to the realization that solid waste management should also be their concern. Therefore the establishment of community health clubs in Nenyere has scored success and improved solid waste management"*

Responses from questionnaires revealed that the effectiveness of the community in solid waste management solely depends on the necessary support they expect from different stakeholders. The community groups clearly pointed out that whenever they get full support in activities such as recycling, composting, education awareness and clean up campaigns they participate wholeheartedly like what is currently taking place in Nenyere. In this vein, community

participation is effective but lack of support from various stakeholders hampers their effectiveness. This concurred with the views of Tisunungureiwo Recycling Cooperative Director. She said, "*If community based groups are given enough technical and financial assistance they will have the capacity and capability to undertake their activities expeditiously."*

Statistical testing on people's attitude and the effectiveness of community participation in solid waste management was undertaken by the researcher using the Chi- Square Test basing on responses indicated in Table 4.7 above.

Hypothesis

H_0 - There is no association between people's attitude and effectiveness of community participation in solid waste management.

H_1 - There is an association between people's attitude and effectiveness of community participation in solid waste management.

Basing on the information shown in Table 4.7 the Chi Square value is 21.72 and the critical value for Chi Square at 95% confidence level is 7.82 and at 99% confidence level the critical value is 11.34 and both values are greater than the Chi Squared value (X^2) .In this case H_0 is rejected and H_1 is accepted, hence there is a significant association between people's attitude and effectiveness of community participation in solid waste management. Basing on the fact that people have different perceptions and attitudes towards a developmental project, variations are likely to exist between and within individuals towards the outcomes of the project. Participation levels of community health clubs, supporting organisations, recycling cooperatives and residents as well as progress made in a given period were taken into consideration to evaluate its effectiveness. In this regard responses from questionnaires and conducted interviews therefore produced these variations.

4.4.3 Views of respondents on community involvement as a solid waste management option

From the conducted interviews and administered questionnaires different opinions were aired out by the respondents on how they perceive the involvement of communities in solid waste management. Responses from the administered questionnaires clearly highlighted that

community participation is a pragmatic tool in alleviating solid waste challenges affecting the local authority. Various options suggested include the community, Local Authority and the private sector or combination of the three. The respondents suggested that collaboration of the community with various stakeholders is one of the best options in tackling solid waste management issues since communities are responsible for generating waste, handling and its disposal. The outcome of the suggested options is shown below in figure 4.6.

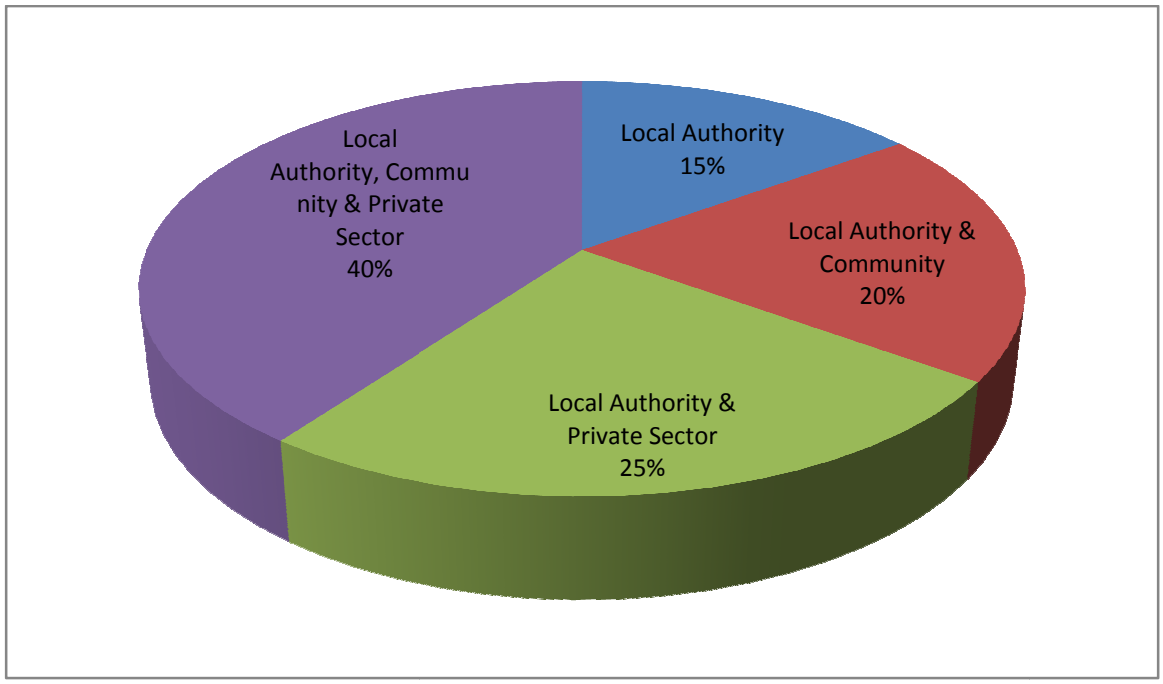

Figure 4.6 Respondents' views on solid waste management options

In figure 4.6 about 40% of the respondents highlighted that involving communities in activities such as clean up campaigns, composting, waste recycling and education awareness with the support of the local authority and the private sector is improving solid waste management in Mbare. In this regard, addressing critical issues at grassroots level is therefore imperative. They also pointed out that concerted efforts by the local authority and the private sector make solid waste management fruitful when these community activities are fully supported. Joint venture between the community, local authority and private sector has been prescribed as the best option to deal with solid waste since coordinated efforts as well as financial and technical support enhances viability of solid waste management strategies. Combined efforts of the local authority and private sector attracted 25% of the respondents who subscribed to the view that the private

sector plays a pivotal role in solid waste management through assisting the financially crippled local authorities in the provision of loans to purchase refuse vehicles, fuel and supporting community projects and activities linked to solid waste management.

In addition, the option of collaborating the local authority and the community was acknowledged by 20% of the respondents who posited that close cooperation between the local authority and the community enhances shared responsibility in solid waste collection and management as mandated in the Urban Councils Act and Municipal By Laws. However, 15% of the respondents opted for the local authority to operate as a stand-alone unit since conflicts, lack of cooperation and poor coordination between stakeholders are impediments to proper solid waste management and in line with this the local authority should be fully responsible for undertaking waste management services in areas under its jurisdiction. Contrariwise, the least percentage (15%) of considering the local authority as an option can be attributed to its incapacity to provide efficient solid waste management services that sometimes bring these services into a comatose and disarray.

The researcher noted that community involvement in solid waste management in Nenyere, Mbare was hailed by the interviewees who include the Operations Manager of the Waste Management Department, project officers from Oxfam, Practical Action, ZELA and EMA. They all subscribed to the notion that communities can be better partners in solid waste management if decentralization of waste management services is done and full technical and financial support by various stakeholders is granted to the residents. This will therefore facilitate the establishment of waste collection points in the residential areas, thus reducing costs incurred in door to door collection services. In an interview with the COH Waste Management Department Operations Manager he said, "Community *involvement gives residents a sense of stewardship and hence encourage them to play a pivotal role in waste sorting, separation and recycling projects that are environmentally sustainable."*

Responses from the focus group discussions held by the researcher with the waste management department staff, community health clubs and few residents indicated that community involvement in solid waste management is pertinent. They asserted that communities cover the gap in waste collection when they undertake clean up campaigns and educational campaigns which ensure that communities take the lead in maintaining a clean and safe environment. In line

with the views alluded above, the researcher noted that community participation is a useful tool in solid waste management if joint initiatives between the local authority, NGOs and the private sector are done based on the premise that an integrated approach promotes shared responsibility in sustainable solid waste management.

4.5 Perceptions on environmentally sustainable solid waste management strategies

Results obtained from the administered questionnaires and interviews indicated that various solid waste management strategies that are environmentally sustainable can be adopted or promoted to improve solid waste management at household, community, local and national level. Strategies that were proposed by respondents include composting, waste separation at source, waste recycling, incentives, environmental education, reuse, reduce and promotion of clean up campaigns. From the aforementioned strategies of improving solid waste management in high density residential areas environmental education was viewed as a pragmatic tool that can best address the culture of littering done by residents. In an interview, the Waste Management Department Operations Manager said "*There is need for intensive environmental education in high density residential areas in order to change the culture of littering and irresponsible behaviour by the citizens*." The residents and interviewees all concurred that the strategies alluded above are environmentally sustainable and imperative in improving solid waste management.

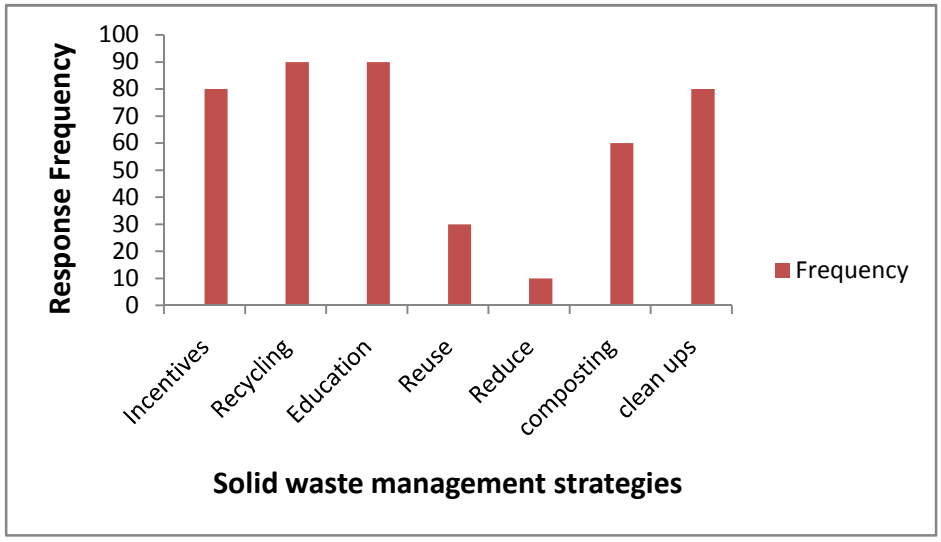

Figure 4.7 Solid waste management strategies and response frequency

From figure 4.7 it can be deduced that environmental education, waste recycling, incentives and clean up campaigns received great consideration from the respondents constituting frequencies of 90 and 80 respectively. Composting also attracted the respondents' attention with a frequency of 60 followed by reuse and reduces as the least considered strategy with frequencies of 30 and 10 respectively. The highly accepted strategies such as recycling, education awareness, clean up campaigns and composting are currently being undertaken but full support for their effectiveness in solid waste management is required. The introduction of incentives in cash and in kind (foodstuffs, clothes, stationery) is also expected to improve solid waste management since they motivate participants to participate wholeheartedly. The Project Officer from Environment Africa also articulated that great strides should be taken to support the coding system that necessitates the proper and systematic storage of waste according to type. This strategy makes the storage, collection and disposal of waste by the local authority easier and more sustainable.

The strategies alluded above are crucial in alleviating solid waste management challenges and there is urgent need for coordinated efforts, close cooperation and mutual understanding amongst participants to bring these strategies to success. Environmental benefits of waste reduction and cleanliness as well as socio-economic benefits can be greatly realized at household and community level.

4.6 Legislation and Institutional Aspects

The researcher also delved into legislation and institutional aspects which affect solid waste management in urban areas so as to assess the knowledge of the community as far as the legal and institutional aspects are concerned as well as identifying gaps that may exist.

4.6.1 Awareness of legal institutions involved in solid waste management

Responses from the administered questionnaires revealed that different levels of awareness on legislation and institutional aspects exist amongst the residents. The legal institutions involved in waste management include the Environmental Management Agency, Local Authority and ZELA. EMA administer the Environmental Management Act (CAP 20:27) whereas the Local Authority administer the Urban Councils Act (CAP 29:15) and the Municipal By Laws whilst ZELA fosters the implementation of these laws when undertaking environmental projects with communities. They play a pivotal role in keeping the environment clean. The different levels of awareness of the laws and legal institutions are tabulated in Table 4.8 below

Table 4.8 Levels of awareness of respondents on legal institutions and existing legislation

Gender	Low	Moderate	High	Very High	Total
Male	24	12	5	3	44
Female	34	16	10	6	66
Total	58	28	15	9	110

From Table 4.8 awareness levels were categorized into four groups which are low level, moderate, high and very high level of awareness in relation to the gender of respondents. The low level category constituted 53%, followed by the moderate level with 25%, high level with 14% and the very high level being the least with 8% of respondents. Awareness levels of respondents can be determined by educational level, gender, individual interests in environmental issues and the level of community participation in solid waste management activities when these institutions undertake different solid waste management projects. Low levels of awareness represented by 53% were attributed to lower educational levels, little or limited interest in environmental issues and little or limited interaction of individuals with legal institutions dealing with solid waste management. Awareness can also be influenced by the frequency at which these legal institutions interact with the communities in environmental programmes. The lower the interaction between the institutions and residents the lower the level of awareness. The respondents asserted that the moderate (25%), high level (14%) and very high (8%) recognition of these institutions is attributed to the fact that ZELA and the Local Authority support communities in recycling whilst EMA participates in clean up campaigns and education awareness programmes. The local authority is well known in waste collection and disposal services in the greater Harare.

Statistical tests were employed to test whether gender and level of awareness on legal institutions and existing legal frameworks are significantly related. Basing on the information shown in Table 4.8 above a Chi Squared test was done by the researcher to establish whether there is a significant association between level of awareness on legal aspects and gender.

Hypothesis

H_0- There is no association between gender and level of awareness on legal aspects.

H_1- There is an association between gender and level of awareness on legal aspects.

Using the information given in Table 4.8 the value for Chi-square Test is 0.63 and the critical value at 95% confidence level is 7.82 and therefore greater than the X^2.In this case H_1 is rejected and H_0 is accepted, hence there is no significant relationship between gender and level of awareness on legal aspects. Basing on the fact that females are more concerned with sanitation and hygiene issues than their male counterparts variations are likely to be expected. From this perspective 60% females and 40% males participated in filling questionnaires and interviews during the research study, hence the existence of these variations.

4.6.2 Effectiveness of Legal Institutions

The results from the interviews and questionnaires indicated that the respondents have different views pertaining to the effectiveness of these institutions as shown in figure 4.8 below.

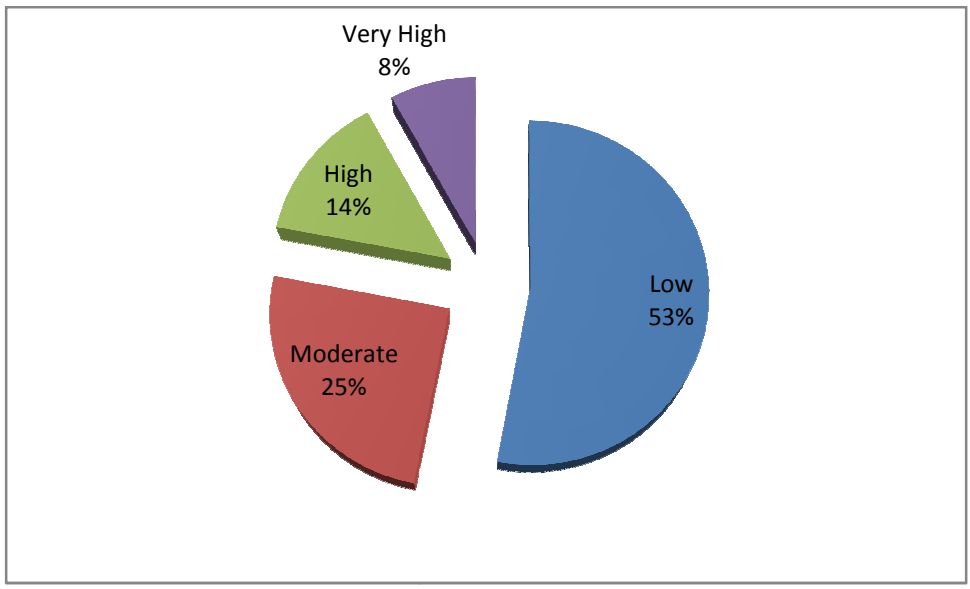

Figure 4.8 Respondents' views on effectiveness of legislation and legal institutions

Statistical results obtained from the responses indicated that 53% of the respondents view these institutions as ineffective whilst 25% suggested that they are moderate.14% posited that effectiveness is high and 8% pointed out that the effectiveness of legislation and legal institutions

is very high. Different reasons were cited by the respondents on the ineffectiveness of these institutions. The low effectiveness is based on the solid evidence of the proliferation of illegal dumps in both the residential areas and the Central Business District which really shows that the Local Authority and EMA are failing to undertake their duties of penalizing culprits.

This was further buttressed by the Practical Action project officer who pointed out that gaps exist in the enforcement of legislation by EMA which lacks the capacity to educate the residents on the provisions of the law. They only target the Local Authority for the filthy in the urban areas but fail to highlight the proper initiatives to take. The Operations Manager of the Waste Management Department attributed their ineffectiveness to the lack of financial resources to purchase, service and maintain the refuse collection fleet as well as inadequate resources which are incommensurate with the growing population. On a positive note, the respondents who suggested that the effectiveness is high (14%) and very high (8%) argued that those found on the wrong side of the law are paying punitive fines and since the dollarization of the economy full implementation and monitoring of the law is at an advanced stage as compared to the period prior 2009.

4.6.3 Compliance of the community to the existing legislations

Evidence gathered from the respondents during interviews and from the administered questionnaires revealed that there is compliance and non compliance of residents or citizens to the existing legislations related to solid waste management such as the Environmental Management Act (CAP 20:27), Public Health Act (CAP 15:09), Urban Councils Act (CAP 29:15) and Municipal By-Laws. About 58 % of the respondents articulated that there is low or non-compliance of the existing legislation. This is evidenced by the proliferation of illegal dumpsites in the residential suburbs caused by the community's irresponsible behaviour in properly handling solid waste. However, 33 % pointed out that compliance of the legislation is moderate and this is specifically by concerned residents who are aware of the provisions of the law and dangers of littering. The remaining 9% for those with high compliance to the existing legislation represented the minority who has the environment at heart, who adhere to waste collection schedules and those who fully understand the provisions of the law as well as the course of action taken by legal institutions for non compliance. The COH Waste Management

Department Operations Manager asserted that residents do not comply with the Waste Management By-Laws which stipulate that the Local Authority provides receptacles to the residents and residents have to put their bins out for collection but residents deliberately miss the collection schedules and illegally dump the waste. The ZELA director also propounded that the citizens have a culture of non compliance, adamant and are highly resistant to adhere to the obligations of the existing laws. In an interview, Oxfam Project Officer stressed that existence of illegal dump sites in residential areas is a clear reflection of residents' non compliance to existing legislations.

4.6.4 Views of respondents on legislation as a tool for solid waste management

The researcher obtained different views from respondents during interviews and from administered questionnaires on their perceptions of legislation as a solid waste management tool. Respondents were asked to choose from five options namely agree, strongly agree, disagree, strongly disagree and "don't know" option. Results from the research study indicated that 22% of the respondents agreed that legislation is a pragmatic tool in ameliorating solid waste management challenges affecting local authorities in Zimbabwe's urban areas and 19% strongly agreed. Contrariwise, 31 % disagreed and 15% strongly disagreed that legislation is not the best tool to curb solid waste management challenges. Those who collectively agree (41%) pointed out that legislation is imperative since it deters people from wanton littering by putting in place punitive measures that include fine, jail term or both. In this vein, it prohibits the disposal of waste at undesignated sites. 46% of those who collectively disagree articulated that the provisions of the law are harsh, difficult to understand and does not fully accommodate the views of the people. Moreso, these laws take the "criminal law approach" which addresses matters after their occurrence rather than being preventive and in this regard, the laws therefore received great condemnation. However, 13% of the respondents highlighted that they have no idea of the legislations in place due to high illiteracy levels on legal and environmental issues.

However, some respondents argued that legislation is not the last resort. The Waste Management Department Operations Manager said *"It is better to use the education awareness strategy rather than legislation. People should be educated first on the provisions of the law and the harmful imprints posed by poor solid waste disposal. In tandem with this, education must therefore*

*change their attitudes and character."*The Director of ZELA also articulated that the existing legislative frameworks such as the Environmental Management Act and the Urban Councils Act have loopholes that result in policy failure and ineffectiveness in a bid to improve solid waste management. Community participation and the concept of 4Rs that is Reduce, Recycle, Reuse and Recovery of solid waste should be widely adopted at household, community and national level. In an interview, the EMA Environmental Officer said, *"Legislation is one of the tools that can be used to improve solid waste management in urban areas as long as financial and human resources are adequate enough to make enforcement and monitoring of the law effective. Other strategies such as environmental education, stakeholder participation, recycling and reuse must work hand in hand with legislation to improve solid waste management in urban areas."* In this regard the researcher noted that respondents have different views on residents' attitude towards existing legislations on waste management as elucidated above.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

From the research study it was observed that organic waste constituted the dominant solid waste stream and accounted for over 50% of all solid waste generated at household level in Nenyere, Mbare followed by inorganic waste. Varying amounts of solid waste are generated in Mbare at household level depending on socio-economic factors such as household size, income levels, and most importantly the season of the year. Commingling or commixing of the solid waste generated in plastic bags is the storage method used by the residents before the waste is disposed or collected for disposal by the local authority.

Various solid waste management activities are being undertaken by the community in Mbare (Nenyere) in a bid to alleviate challenges of solid waste management bedeviling the local authority. These activities include solid waste collection and recycling, environmental education, clean up campaigns and composting of organic waste. Various Community Health Clubs are involved in composting, clean up campaigns and environmental education under the auspice of non-governmental organisations like Oxfam and the local authority in response to the Water, Sanitation and Hygiene programme (WASH) aimed at empowering communities in solid waste management issues. Waste Recycling Cooperatives such as Tisunungureiwo Recycling Cooperative are also the major players involved in solid waste recycling in Mbare and they also get legal and technical support from ZELA and the local authority respectively. Generally speaking, the mentioned activities forms the basis of the Zimbabwe Urban Environment Programme (ZUEP) aimed at improving cleanliness in neighbourhoods as well as improving the standards of living of the urban poor as income can be realized from solid waste.

A close investigation on the effectiveness of community participation in solid waste management revealed that community participation is slightly effective in activities supported by NGOs, EMA and Local Authority such as clean up campaigns, composting, waste collection, recycling and to a lesser extent educational awareness. Improvements in environmental cleanliness were noticeable in Mbare at household and community level. Reusable and recyclable materials such as plastic containers, plastics, papers and metal cans that once decorated every street corner are now rarely being found because of their economic value. The same applies to organic waste which was indiscriminately dumped by the residents before they knew its importance at

household level. Currently, it is being composted and not put to waste. This has drastically reduced the number of illegal dumps and quantity of solid waste generated in the residential area. However, full support from various organisations such as the private sector and local authority is paramount in enhancing full community participation since the merging of these three was acknowledged by the majority as a sustainable waste management option in solid waste management. In this regard, community involvement was appreciated as a pragmatic tool in solid waste management.

A close examination on the legal and institutional aspects revealed that the residents have limited knowledge of the existing legal frameworks on solid waste management such as the Environmental Management Act (CAP 20:27), Urban Councils Act (CAP 29:15), Public Health Act (CAP 15:09) and the Municipal By-Laws and in this regard, low compliance or non-compliance of these laws is prevalent since there is indiscriminate dumping of waste at undesignated sites. Lack of awareness was attributed to limited or lack of educational awareness on the existing laws by EMA and the local authority that are responsible for administering these laws. Due to limited financial and human resources the enforcement of these legislations is weak, thereby making the laws to be obsolete and the institutions to be ineffective.

5.2 Recommendations

In light of the findings from this research it is recommended that:

- The local authority should introduce the colour coding system for efficient storage of solid waste generated according to the types of solid waste generated at household level. For example red for glass, green for plastics, yellow for paper, black for general waste and blue for beverage cans. This colour coding system necessitates easy collection of solid waste by waste recycling groups and the municipality itself.
- The Local Authority and NGOs should assist residents to establish more community health clubs and community based groups that will be involved in sanitation and hygiene programmes aimed at improving cleanliness in their neighbourhoods and full support must be given by the private sector.

- The community should adopt the 4Rs that is Reduce, Reuse, Recycle and Recover approaches that are aimed at reducing the amount of solid waste generated as well as reducing collection and disposal costs to the local authority. The local authority and NGOs must render full support so as to bring these initiatives to fruition.

- A Multisectorial approach or Integrated Solid Waste Management approach (ISWM) that integrates the local authority, private sector and community should be invigorated at national level.

- The Environmental Management Agency and the Local Authority should embark on intensive environmental education so as to conscietise the residents on the existing legislations clarifying the provisions and consequences of violating these pieces of legislation.

- The local authority and the community should collaborate and establish central waste collection points in the residential areas whereby waste is collected by the local authority at central points which is far much cheaper than the curbside collection strategy currently in place which is expensive. The communities should in return be incentivised by the local authority for their service.

- EMA and the Local authority should revise the Environmental Management Act (CAP 20:27) and the Urban Councils Act (CAP 29:15) respectively so as to identify weaknesses and gaps that accentuate policy failure and ineffectiveness in order to make them responsive to waste management challenges. The Urban Councils Act must fully embrace the concept of community participation in solid waste management.

- The Government of Zimbabwe should engage in Twin City arrangements that consolidate cities in Zimbabwe with the cities in the region and abroad in the field of waste management. These arrangements will enable cities in Zimbabwe to access special skills and technological capabilities not locally available at community and national level through exchange programmes.

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APPENDICES

Appendice 3.1: Questionnaire

Midlands State University

Established 2000

My name is **Bothwell F Zamba** a final year student at Midlands State University undertaking a BSc Honours Degree in Geography and Environmental Studies. The purpose of this study is to conduct a research on **Community participation in sustainable solid waste management in high density suburbs. The Case of Mbare, Harare.** The findings are essentially for academic purposes only and confidentiality is therefore guaranteed.

QUESTIONAIRE NUMBER…….

SECTION A: SOCIO-DEMOGRAPHIC DATA

1. **Gender**: Male ☐ Female ☐

2. **Age**: Under 18 ☐ 18-28 ☐ 29-39 ☐ 40-50 ☐ 51-61 ☐ 62+ ☐

3. **Education:** Primary level ☐ Secondary ☐ College/University ☐

4. **Marital Status:** Married ☐ Single ☐

5. **Occupation:** ……

6. How big is your household?

   a) 1-3 members ☐
   b) 4-6 members ☐
   c) 7 and more ☐

SECTION B: WASTE GENERATION AND COLLECTION

7. Which types of solid waste do you generate at household level? .....

8. How much solid waste do you generate per week? ……..

9. Which storage facilities do you have in place before the waste is disposed /collected?

a) Plastic paper bins ☐ b) Plastic container bins ☐

Others (Specify) …….

10) How do you dispose the solid waste generated?

a) Open spaces ☐ Open pits ☐

Others (specify) ……

11) What is the frequency of collection of the solid waste generated?

a) Once per week ☐ b) Twice per week ☐ c) 3 times per week ☐

d) Once per month ☐

12) If the Local Authority fails to collect in time the solid waste generated, how do you dispose it? ……

SECTION C: COMMUNITY PARTICIPATION

13) Which solid waste management activities are you engaged in, collectively as a community?

a) Waste sorting ☐ b) Waste recycling ☐ c) Composting ☐

d) Clean up campaigns ☐ e) Education awareness ☐

Others (Specify)……..

14) Do you receive support from any organization when carrying out these activities?

a) Yes ☐ b) No ☐

15) Which activities are supported most?

a) Clean up campaigns ☐ b) education awareness ☐ c) waste recycling ☐

Others (Specify)…….

16) Which organizations support you in carrying out these activities?

a) Oxfam ☐ b) Practical Action ☐ c) Local Authority ☐ d) Environment Africa ☐

Others (Specify) ……..

17) To what extend is your participation improving solid waste management when you get support from these organizations and give reasons.

……
…….

18) Are you benefiting from your full participation in solid waste management as a community?

a) Yes ☐ No ☐

If Yes, Specify……

……..

SECTION D: PERCEPTIONS ON ENVIRONMENTALLY SUSTAINABLE SOLID WASTE MANAGEMENT STRATEGIES

19) What is your view pertaining to solid waste management in this high density area.

……
……

20) Do you think that community participation is the best way of improving solid waste management in urban areas?

a) If Yes, specify…….

b) If No, specify……

21) Which strategies can be used to improve solid waste management in high density areas apart from community participation?

a) Incentives ☐ b) Recycling ☐ c) Environmental Education ☐ d) Reuse ☐

Others (Specify)……..

SECTION E: POLICY, LEGISLATION AND INSTITUTIONAL ASPECTS

22) Which legal institutions do you know that deal with solid waste management issues in urban areas?

Environmental Management Agency ☐ Local Authority ☐

Others (Specify) ……

23) Are these institutions effective and why?

Yes ☐ No ☐

If Yes, specify……

If No, specify…….

24) Which legislations governing solid waste management are you aware of?

a) Environment Management Act ☐ b) Public Health Act ☐ c) Municipal By-Laws ☐

Others (specify) …….

25) What is your level of compliance on the existing legislations on solid waste disposal practices?

…….

26) Do you think legislation is the best tool for solving solid waste management challenges?

If Yes, specify……

If No, specify……

End of Questionnaire.

Thank you for your co-operation

Appendix 3.2: Semi-Structured Interview guide for Oxfam Environmental Project Officer

NAME OF INTERVIEWEE **…….....**DATE COMPLETED…….

1) Which type of solid waste is generated in Mbare at household level and which type is dominant.

2) What criteria are used to store the solid waste given that there are different types of waste which are generated at household level?

3) What is your view pertaining to the handling and management of the various types of waste generated at household level?

4) Do you have any idea on the amount of solid waste generated per capita per day at household level?

5) What is the amount of solid waste generated according to the different types generated?

6) What are the factors that contribute to the varying amounts of solid waste generated at household level?

7) What solid waste management activities do you undertake with the communities and what support do you give?

8) How often do you participate with the community?

9) How effective is community participation and what is the community's attitude towards solid waste management when you work together?

10) Is community participation the panacea to tackle solid waste management challenges affecting urban areas? Give reasons.

11) Which sustainable solid waste management strategies should be implemented to improve solid waste management at household level, community level and national level?

12) How are the residents complying with the existing legislations on solid waste management?

13) Is legislation the best tool to curb solid waste management challenges in urban areas?

14) From your point of view what measures/strategies must be employed to enhance the effectiveness of legislation on solid waste management to the general public?

Appendix 3.3: Semi-Structured Interview guide for Practical Action Project Officer

NAME OF INTERVIEWEE……DATE COMPLETED……

1) What type of solid waste is generated in Mbare at household level and which is dominant?

2) What criteria are used to store the solid waste given that there are different types of waste which are generated at household level?

3) What is your view pertaining the handling and management of the various types of waste generated at household level?

4) Do you have any idea on the amount of solid waste generated per capita per day at household level?

5) What is the amount of solid waste generated according to the different types generated?

6) What are the factors that contribute to the varying amounts of solid waste generated at household level?

7) What solid waste management activities do you undertake with the communities and what support do you give?

8) How often do you participate with the community?

9) How effective is community participation and what is the community's attitude towards solid waste management when you work together?

10) Is community participation the panacea to tackle solid waste management challenges affecting urban areas? Give reasons.

11) Which sustainable solid waste management strategies should be implemented to improve solid waste management at household level, community level and national level?

12) How are the residents complying with the existing legislations on solid waste management?

13) Is legislation the best tool to curb solid waste management challenges in urban areas?

14) From your point of view what measures/strategies must be employed to enhance the effectiveness of legislation on solid waste management to the general public?

Appendix 3.4: Semi-Structured Interview guide for Environmental Management Agency, Project Officer

NAME OF INTERVIEWEE…….....DATE COMPLETED……...

1) What is the type of solid waste generated in Mbare at household level and which type is dominant?

2) What criterion is used to store the solid waste given that there are different types of waste which are generated at household level?

3) What is your view pertaining the handling and management of the various types of waste generated at household level?

4) Do you have any idea on the amount of solid waste generated per capita per day at household level?

5) What is the amount of solid waste generated according to the different types generated?

6) What are the factors that contribute to the varying amounts of solid waste generated at household level?

7) What solid waste management activities do you undertake with the communities and what support do you give?

8) How often do you participate with the community?

9) How effective is community participation and what is the community's attitude towards solid waste management when you work together?

10) Is community participation the panacea to tackle solid waste management challenges affecting urban areas? Give reasons.

11) Which sustainable solid waste management strategies should be implemented to improve solid waste management at household level, community level and national level?

12) How are the residents complying with the existing legislations on solid waste management?

13) Is legislation the best tool to curb solid waste management challenges in urban areas?

14) From your point of view what measures/strategies must be employed to enhance the effectiveness of legislation on solid waste management to the general public?

Appendix 3.5: Semi-Structured Interview guide for City of Harare, Waste Management Department Operations Manager

NAME OF INTERVIEWEE…….....DATE COMPLETED…….

1) What is the type of solid waste generated in Mbare at household level and which type is dominant?

2) What criterion is used to store the solid waste given that there are different types of waste which are generated at household level?

3) What is your view pertaining the handling and management of the various types of waste generated at household level?

4) Do you have any idea on the amount of solid waste generated per capita per day at household level?

5) What is the amount of solid waste generated according to the different types generated?

6) What are the factors that contribute to the varying amounts of solid waste generated at household level?

7) What solid waste management activities do you undertake with the communities and what support do you give?

8) How often do you participate with the community?

9) How effective is community participation and what is the community's attitude towards solid waste management when you work together?

10) Is community participation the panacea to tackle solid waste management challenges affecting urban areas? Give reasons.

11) Which sustainable solid waste management strategies should be implemented to improve solid waste management at household level, community level and national level?

12) How are the residents complying with the existing legislations on solid waste management?

13) Is legislation the best tool to curb solid waste management challenges in urban areas?

14) From your point of view what measures/strategies must be employed to enhance the effectiveness of legislation on solid waste management to the general public?

Appendix 3.6: Semi-Structured Interview guide for St Peters Church Warden.

NAME OF INTERVIEWEE…….....DATE COMPLETED…….

1) What is the type of solid waste generated in Mbare at household level and which type is dominant?

2) What criterion is used to store the solid waste given that there are different types of waste which are generated at household level?

3) What is your view pertaining the handling and management of the various types of waste generated at household level?

4) Do you have any idea on the amount of solid waste generated per capita per day at household level?

5) What are the factors that contribute to the varying amounts of solid waste generated at household level?

6) What solid waste management activities do you undertake with the communities and what support do you give?

7) How do you mobilize communities to participate and how often do you participate with them?

8) How effective is community participation and what is the community's attitude towards solid waste management when you work together?

9) Is community participation the best tool to tackle solid waste management challenges affecting urban areas? Give reasons.

10) Which sustainable solid waste management strategies should be implemented to improve solid waste management at household level, community level and national level?

11) How are the residents complying with the existing legislations on solid waste management?

12) Is legislation the best tool to curb solid waste management challenges in urban areas?

13) From your point of view what measures/strategies must be employed to enhance the effectiveness of legislation on solid waste management to the general public?

Appendix 3.7: Semi-Structured Interview guide for Environment Africa Project Officer.

NAME OF INTERVIEWEE…….....DATE COMPLETED…….

1) What is the type of solid waste generated in Mbare at household level and which type is dominant?

2) What criterion is used to store the solid waste given that there are different types of waste which are generated at household level?

3) What is your view pertaining the handling and management of the various types of waste generated at household level?

4) Do you have any idea on the amount of solid waste generated per capita per day at household level?

5) What is the amount of solid waste generated according to the different types generated?

6) What are the factors that contribute to the varying amounts of solid waste generated at household level?

7) What solid waste management activities do you undertake with the communities and what support do you give?

8) How often do you participate with the community?

9) How effective is community participation and what is the community's attitude towards solid waste management when you work together?

10) Is community participation the panacea to tackle solid waste management challenges affecting urban areas? Give reasons.

11) Which sustainable solid waste management strategies should be implemented to improve solid waste management at household level, community level and national level?

12) How are the residents complying with the existing legislations on solid waste management?

13) Is legislation the best tool to curb solid waste management challenges in urban areas?

14) From your point of view what measures/strategies must be employed to enhance the effectiveness of legislation on solid waste management to the general public?

Appendix 3.8: Semi-Structured Interview guide for Tisunungureiwo Recycling Cooperative Director

NAME OF INTERVIEWEE……DATE COMPLETED……..

1) What is the type of solid waste generated in Mbare at household level and which type is dominant?

2) What criterion is used to store the solid waste given that there are different types of waste which are generated at household level?

3) What is your view pertaining the handling and management of the various types of waste generated at household level?

4) Do you have any idea on the amount of solid waste generated per capita per day at household level?

5) How do you separate the types of solid waste you collect for recycling?

6) What are the factors that contribute to the varying amounts of solid waste generated at household or community level?

7) What solid waste management activities do you undertake and do you receive any support?

8) Which organisations support you and in what ways?

9) What benefits do you get and what challenges do you encounter from your recycling business?

10) How effective is community participation and what is the community's attitude towards solid waste management when you work together?

11) Is community participation the panacea to tackle solid waste management challenges affecting urban areas? Give reasons.

12) Which sustainable solid waste management strategies should be implemented to improve solid waste management at household level, community level and national level?

13) How are the residents complying with the existing legislations on solid waste management?

14) Is legislation the best tool to curb solid waste management challenges in urban areas?

15) From your point of view what measures/strategies must be employed to enhance the effectiveness of legislation on solid waste management to the general public?

Appendix 3.9: Semi-Structured Interview guide for Zimbabwe Environmental Law Association (ZELA) Director

NAME OF INTERVIEWEE……..DATE COMPLETED……...……...

1) What is the type of solid waste generated in Mbare at household level and which type is dominant?

2) What criterion is used to store the solid waste given that there are different types of waste which are generated at household level?

3) What is your view pertaining the handling and management of the various types of waste generated at household level?

4) Do you have any idea on the amount of solid waste generated per capita per day at household level?

5) What are the factors that contribute to the varying amounts of solid waste generated at household level?

6) What solid waste management activities do you undertake with the communities and what support do you give?

7) How often do you participate with the community?

8) How effective is community participation and what is the community's attitude towards solid waste management when you work together?

9) Is community participation the panacea to tackle solid waste management challenges affecting urban areas? Give reasons.

10) Which sustainable solid waste management strategies should be implemented to improve solid waste management at household level, community level and national level?

11) How are the residents complying with the existing legislations on solid waste management?

12) Is legislation the best tool to curb solid waste management challenges in urban areas?

13) From your point of view what measures/strategies must be employed to enhance the effectiveness of legislation on solid waste management to the general public?

Appendix 3. 10: Semi Structured Interview guide for the Community Health Clubs: Zeza Tsvina, Anotidaishe and Jabulisa Community Health Club Chairpersons.

NAME OF INTERVIEWEE……..DATE COMPLETED……..

1) What inspired you to establish community health clubs in this high density suburb?
2) As far as membership and participation is concerned which gender is active in the club and why?
3) Which type of solid waste do you generate at household level and which type do you prioritise before disposal?
4) What solid waste management activities do you undertake a club?
5) Do you face any challenges when undertaking these activities? If so how do you tackle them?
6) Which organisations support you in undertaking these activities and in what form?
7) Since the establishment of these health clubs is there improvement in solid waste management in this high density suburb?
8) Do you think community participation is the panacea to solve solid waste management challenges in urban areas?
9) Which solid waste management options should be adopted at national level to address solid waste management challenges affecting urban local authorities?
10) Which environmentally sound waste management practices should be adopted at household, community and national level?
11) Are the legislative frameworks and legal institutions that deal with waste management effective?
12) What is your level of compliance to the existing legislations?
13) Is legislation the best tool to curb solid waste management challenges in the urban areas?
14) Which strategies should be used to enhance the effectiveness of legal institutions and existing legal frameworks on solid waste management?