International Journal of Education Humanities and Social Science

ISSN: 2582-0745
Vol. 3, No. 02; 2020

RESIDENTS' PERCEPTIONS OF WASTE AND WASTE MANAGEMENT IN URBAN COUNCILS: CASE OF CHEGUTU MUNICIPALITY, ZIMBABWE

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ABSTRACT

The purpose of this study was to explore urban council residents' perceptions of waste and its implications for cooperative waste management strategies in Chegutu Municipal area. The study was motivated by the observation that, urban council residents generate waste which their local authorities are unable to manage. The study was guided by the pragmatism philosophy. It facilitated the collection of data by mixing qualitative and quantitative methods. Data collection started by visits to residential areas in 9 wards to verify problem magnitude. Purposive samples of 65 residents' from 9 wards responded to questionnaires to capture perceptions. A focus group of 15 residents from each ward collected group perceptions and possible cooperative waste management strategies. Five municipal workers and 18 vendors were interviewed. Document analysis of municipal statutes provided the legal framework for the integrated waste management strategy. A hypothesis test confirmed that, residents' perceptions were associated with residents' residential area. The study found that: Residence perceived only solid waste as waste. They could categorize it as paper, plastics, glass, metals, rubber and rarely leaves. The vehicle informal sectors operating garages anywhere were identified as the largest source of metal waste. Since liquid and chemical wastes were not considered as waste, no strategies were suggested for their management. The study recommends awareness campaigns for the different types of waste (emphasis on liquid waste), how they are generated, their toxicity and an integrated waste management system based on 3R principles of reduce, reuse and recycle. Specifically, the study educates residents to: reduce waste generation, separate solid waste, sell recycled material, composite and bin the rest for council incineration and/or land filling.

Key Words: Urban Residents, perceptions, solid waste management, Chegutu municipality.

1. INTRODUCTION

1.1 Background to the study

Chegutu Municipality is located 110km South West of Harare along the Harare- Bulawayo highway in Zimbabwe. Chegutu Municipality started as a local board in 1934. It was established to cater for the farming community in its vicinity. As a farming community, its population then, was composed of mainly male labourers. These spend their day in the fields and were in the compound for the night rest. Such a set up generated limited waste in the compound. The population then had few woman and children whose food consumption patterns generated

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limited volumes of waste. During that time, waste management was the responsibility of the farmers.

Chegutu acquired its Municipal status in 1974 and started off with 4 Wards. Currently it has 12 wards. In 2002, Chegutu's population was at 22 726. Zimstat, (2012) pegs the population on 49 832. Simple calculation gives 11,93% growth rate. There has been no significant expansion of infrastructure to cater for that growing population. This increase is contributing to the strain on service delivery as shown by heaps of garbage in open spaces and road verges that are now common. The situation also resulted in an increase in the number of stray dogs and fly population.

The growth of urban population and unemployment has been associated with the proliferation of vendors whose activities contribute significantly to blighting the environment. In most high-density suburbs, the word clean environment no longer applies. Residential areas are swamped by vendors selling their wares everywhere. Despite the provision of designated places to carry out such kind of activities, vendors and their clients generate all kinds of waste. From wrappers, fruit seeds to food left overs.

The emergence of waste management as a significant component of environmental control has evolved due to the growing urgency of urban environmental problems. Agenda 21, included waste management as a significant output of the United Nations Conference on Environment and Development during the 1992 Earth Summit.

Improperly managed waste has short- and long-term implications to the environment and human health. Despite the growing awareness of the potential threat that inappropriate handling of solid waste poses to the environment, there has been no resultant improvement in the way solid waste management in developing world is handled. Srinivas, (2003) suggests that in contrast to the developed world, cities in developing countries such as Chegutu (Zimbabwe) and Mexico City (Mexico) are still in a transition stage towards better solid waste management methods. Currently they have inadequate solid waste collection and improper disposal systems. High levels of poverty in some developing countries and a mass exodus of people from the rural areas into towns has multiplied waste management challenges into an exponential function.

For a long time, solid waste was managed by condoning due to the perception of waste as a valueless and harmless substance. The growing realization that waste disposed of improperly can pose serious problems to the environment and health of the society has motivated initiatives for conscientious approaches to solid waste management (UNIDO, 2003).

According to Mulenga et al (2004) solid waste management is given low priority in developing countries because of their more pressing issues. Challenges such as high infant mortality, staggering rates of HIV/AIDS and their related deaths as well as difficulties in providing basic amenities are top on their agenda.

Existing studies on solid waste management also point to the relationship between governance and solid waste management. Tevera (1991) associates urban solid waste disposal problems with economic policy failures at either local or national government levels. He further attributes

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inefficient solid waste management systems to a poor revenue base. In fact, lack of meaningful investment in solid waste infrastructure hampers maintenance of waste management equipment. MacGranaham (1991) and Amis (1992) have cited administrative incapacity and institutional weaknesses as major factors accounting for poor solid waste management systems in Sub-Saharan Africa.

This stand point is refuted by Hardoy *et.al* (2001) who defensively argues that prolonged under-investment in waste management is the major factor leading to deterioration of the quality of solid waste management systems. Unstable macro-economic environments have also been cited as contributory reasons.

Developing countries are experiencing the world's highest population growth rates. According to UNDP (2001: 51), 40% of the population in Southern Africa is now resident in urban areas. This 40% population is increasingly being joined by more and more people in search of better living standards in the city. Studies by Glazewski (2005: 39) points out that South Africa is producing 300 million tons of solid waste per year. Of this waste 2 million tons are classified as being hazardous. Ninety five percent (95%) of this waste is disposed of in the most common and cheapest method applied in developing countries by land filling.

Kativu (2000: 17) declares that, Harare alone generates about 1040-1400 tons of waste every day. The waste composition in Zimbabwe is mostly characterized by organic wastes with a moisture content of (55-75) % making it very suitable for composting. This statement overshadows liquid waste and its' toxicity. It also ignores the fact that glass, plastics and rubber does not decompose.

Of the 1040 tons of waste, only 180 tons is collected for disposal at open dumps. These are the most prevalent disposal sites for waste in Zimbabwe. None of the collected waste is composted. The remainder of the waste that is not collected becomes an eyesore on every street corner and alley. The solid waste crisis being experienced in Zimbabwe has been compounded by rapid urbanization and a slowly developing economy that can scarcely afford to divert large sums of money towards waste management.

How much waste Chegutu population generates has not been quantified. Solid waste in Chegutu is managed by Chegutu municipality. In the face of insufficient waste management services, residents have resorted to burying, burning, or dumping their waste where ever they see fit.

1.2 Statement of the Research problem

Chegutu residents' perception of waste and waste management has not been documented for municipal waste management strategy. Residents are disposing their waste everywhere resulting in heaps of uncollected garbage. In terms of the Solid Waste Environmental Management Regulations, Chegutu Municipality has been classified in the red band category which indicates that solid waste management is poor hence the Municipality is always being fined by Zimbabwe's Environmental Management Agency (EMA).

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The prevalence of all sanitation-related diseases claiming lives arise from inadequate urban waste mismanagement. Residents experience waste spills as municipal tractors passes by, leaving them open to possible contact with filth, micro and macro organisms and pathogens which lead to possible disease outbreaks. Since waste is generated by residence and waste management requires stakeholders' cooperation, the current study sought residents' perceptions of waste and cooperative waste management strategies for urban waste in Chegutu Municipality.

1.3 Research Questions

The following research Questions guided the study

i) What are Chegutu residents' perceptions of waste?
ii) How can residents' perceptions be incooperated in waste management?
iii) What cooperative waste management strategies can Chegutu apply?

1.4 Objectives

The study sought to:

i) Document Chegutu residents' perception of waste.
ii) Establish the role of residents' perceptions in waste management.
iii) Suggest cooperative waste management strategies suitable for Chegutu Municipality.

1.5 Significance of study

This study is important for contributing an integrated approach towards the improvement of waste management for urban towns like Chegutu. It contributes towards waste management in urban councils. The study's conception is that, residents contribute towards waste generation hence knowledge of their perceptions is a critical step towards cooperative waste management. The study is a rich source of insights for policies on managing waste. It contributes significant literature and insights to residents' perceptions on waste management.

1.6 Literature Review

The transition from colonial rule to majority rule in 1980 saw the lifting of decades of racial restrictions and increased influx of Africans into cities in Zimbabwe. The rise in urban population increased rates of waste generation. Chenje *et al*, (1998: 61) suggest that, from 1980 up to 1998 increases in waste generation were matched with waste collection in about 80% of most urban centers. Since 1995, nearly all waste management systems in urban centers in Zimbabwe started to collapse due to access utility pressure.

Jansson (1997) attributes the problem of increased solid waste to the increase in packaging and plastics. Accumulated waste threatens health, damages the environment and adversely affects the quality of urban life. Given these adverse consequences of poor solid waste management, adaptive sustainable solid waste management strategies are of great significance in residential areas in Zimbabwe.

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Solid waste management is an inter relation of variables. In this paper, the following variables are being looked at.

(i) Practical and technical elements of the waste system

(ii) Local context (political, economic and social lives of residence in Chegutu, Zimbabwe)

(iii) Stakeholders involvement in the waste management system

Waste management in a local authority is important in a governance perspective because waste generated in a municipality cannot be handled individually. Waste has public good characteristics because it can be disposed on public or private land. Waste management benefits and affects the whole society because its' decomposition can emit toxins. Onibokun (1999) observes that since waste is a public good, people often think that it is the government's responsibility to keep the environment clean.

Scheinberg, Klundert and Anschütz, (2001) concluded that, there is no absolute solution to waste management that fits all cities and towns. What works in the rich areas, might not be suitable in low income areas of the same city. An underlying fact that is underscored by Scheinberg, Klundert& Anschütz, (2001) is that not all cases of solid waste mismanagement require financial resources, sometimes a change in social, institutional or political conditions is the solution. In fact, structured waste management campaigns targeted at the right people can change those people's attitudes and behaviors.

An analysis of the urban waste management crisis in Zimbabwe points to several critical variables at play apart from lack of financial resources and equipment. These are attitude problems among the residents, waste management staff or private enterprises. Significant factors such as the institutional framework or social and cultural context also come into play. This study is motivated by the observation that these factors are human functions which can be managed by training hence the need to explore residents' perceptions on waste management.

This study takes as a point of departure four basic ideologies which are Equity, Effectiveness, Efficiency and Sustainability. Equity points to the idea that all residents are entitled to a suitable waste management system for environmental health reasons.

Effectiveness points to a waste management model which leads to the safe removal of all waste. Efficiency in this study implies maximization of the benefits, minimization of the costs and optimization of the use of resources for waste management.

Sustainability addresses the suitability of the waste management system to the local conditions. That is ecological relevance. A waste management system that is suitable from a technical, environmental, social, economic, financial, institutional and political perspective is essential for this study. Such a system can maintain itself over time without exhausting the resources upon which it depends. The high-profile elements of such conception are collection, transfer and disposal or treatment. Equally important are waste minimization methods of composting reuse and recycling. How these may be implemented is a critical aspect of this study.

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In this study, the various aspects through which waste management system can be assessed will be explored. The weight is not only put on technical and financial aspects of the system. It also examines environmental, social, health, legal, political, institutional and economic aspects. This approach ensures that all the local issues affecting waste management in Chegutu are taken into consideration. Participants' views enable residents to contribute and co-own the strategies.

Participatory approach and the involvement of stakeholders are key dimensions in the study. Chegutu municipality has several roles involving different stakeholders. Within it are policymakers with a mandate to legitimize and support the roles of the community, micro- and small enterprises (MSE). Municipality residents are also responsible for the generation, providing reliable disposal facilities and implementing new interventions.

Households have a key role in solid waste generation, storage and collection. The role of residents in waste recycling, re-use and disposal will be investigated. Residents have both an individual and a collective responsibility as the community. Their views become critical strategy variables which must be pursued.

Accordingly, the roles of Community Based Organizations (CBOs) are to mobilize the households, supervise performance by service providers and coordinate waste management activities. Other stakeholders in the community may be active as waste generators or waste service users. It can also be the formal or informal sector which trades with used items or initiators of awareness raising campaigns. From the above discussion, it can be deduced that the Chegutu community has to coordinate different groups for effective waste management. The study therefore seeks to strike a compromise between the various stakeholders to improve solid waste management system in Chegutu Municipality.

Makanyeza et al (2013) insists that strategies to improve waste management include increasing citizen participation in the affairs of the local authority and partnerships with the community. An underlying fact that is underscored from Makanyeza's (2013) analysis is the participation of stakeholders who generate the waste. In the development of management strategies on urban solid waste, stakeholders of Chegutu Municipality need to play a pivotal role.

The stakeholder theory proposed by Freeman in 1984 argues that an entity should create value for all stakeholders. The stakeholder theory has taken center stage in developmental issues that deal with people. As reported by Freeman (1984), Stakeholder means any group or individuals, who can affect, or is affected by the achievement of the organization's objectives. Bryson (1985) proposed a more comprehensive definition for the term, where a stakeholder is defined as any person or group, or organization that can place a claim on an organization's attention, resources, output, or is affected by that output. This concept requires the study to consider those who generate and those who manage waste in Chegutu.

According to the theory, stakeholders must core-own and contribute management strategies which affect them. Stakeholder theory also looks at the manner in which stakeholders approach the organization to claim their rights. Gomes, (2006) established that local organizations attract

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multiple stakeholders with different interests and amounts of power. These variations must be netted for the benefit of waste management programs.

Chegutu which belongs to urban city sector, as a municipality is made up of various stakeholders, namely: residents, policy makers, central government, political leaders and officials. In this case, councilors are identified as decision makers. They are empowered to make decisions supported by the skills and expertise of senior officers. Senior officers derive their power from their control of expert power and knowledge.

Central government and full council have ownership interests and set the agenda for local authority. Those who deliver services dictate the pace and control skills. Such stakeholders include employees, voluntary organizations, public and private partners. The citizens' power is based on their payment of rates and voting rights. They are represented by councilors who make decisions on their behalf. The study thus seeks to determine how residents can contribute to solid waste management system in Chegutu.

UNEP, (2009:15) remarks that municipalities in many developing countries spend 20-30% of their budgets in solid waste management but 30-60% of solid waste remains uncollected. Actually less than 50% of the population gets waste collection services. UNEP (2009) recommends that one of the ways to get around the problem of solid waste management in developing countries is implementing an integrated solid waste management system where waste is diverted for materials and resource recovery. Substantial volumes of waste are reduced while recovered materials can be used to generate income that can fund solid waste management. Baud and Schenk (1994) underscore that with appropriate segregation and recycling systems in place, great amounts of solid waste can be diverted from landfills to useful resources. It is thus paramount that when considering an integrated solid waste management system, consideration is given to the hierarchy of methods namely reduce, recycle, incineration and landfill.

Kollikkathara et al (2009) is of the opinion that solid waste management methods cannot be similar or universal across communities but should be tailor made for the communities served. Unique factors across communities like fuel costs, capital costs, waste quantities and waste composition are critical. Socio-cultural attitudes demand that solid waste management modalities be customised to communities served. Zuilen (2006) summarises the integrated solid waste management as a waste management system that best suits the society, economy and environment in a given location, a city in most cases.

Then, Tanskanen (2000:22) defines integrated solid waste management as the "…selection and application of suitable techniques, technologies and management programs to achieve waste management objectives and goals". The integrated solid waste management approach views waste management as an equity and public health issue. This implies that all people have a right to a regular waste collection and proper sanitation. Puorideme (2010:8) explains integrated solid waste management as a comprehensive solid waste model that combines "elements of waste prevention, recycling, composting, and disposal with active stakeholders 'participation which ensures efficient and sustainable waste management". Integrated waste management therefore

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focuses on managing waste in ways that protect the health of the humans, the environment and considers an evaluation of local needs.

In their study Mangkoedihardjo et al (2007:33) suggests that in order to make waste management sustainable in low income urban areas, the provision of neighbourhood advisory committee (NAC) for solid waste management, should be part of each management scheme. Integrated solid waste management differs from the conventional approach towards waste management by seeking stakeholder participation. Also unique to it is covering waste prevention and resource recovery. Briefly, the integrated solid waste management approach is a multi-faceted approach, which will make technology choices easier and more sustainable.

2. METHODOLOGY

2.1 Research Design

The purpose of this study, (to explore urban council residents' perceptions of waste and its implications for cooperative waste management strategies in Chegutu Municipal area) renders the study exploratory. The study seeks to explain the behavior and attitudes of residents in their natural settings hence a qualitative approach was used. As affirmed by Halloway and Wheeler (2002), qualitative research permits researchers to explore behaviors, attitudes, perspectives, feelings and experiences in depth through a holistic perspective. The study is carried out without disturbing the day to day operations of the city. Qualitative aplomb allows the environment to speak. It contributes to the interpretation of the findings.

This study's design encompasses descriptive and exploratory research methodologies. According to Van Wyk (2001:9), the main aim of descriptive research is to provide an accurate and valid representation of the variables relevant to the research question.

Qualitative research approach focuses on understanding the social phenomena from the perspectives of the participants. In this study the researcher will gather information on waste management from the residents. Qualitative approach will be used to gather multiple forms of data from interviews, observations and survey.

Quantitative research is generally associated with the positivist paradigm. It usually involves collecting and converting data into numerical form so that statistical calculations can be made, and conclusions drawn. Data analysis and presentation calls for numerical exactness from quantitative field. This study will integrate both qualitative and quantitative methods in order to establish management strategies on urban solid waste. The use of the mixed methods (also known as pragmatic approach) in both data collection and data analysis will allow in-depth analysis.

2.2 Instruments

In this qualitative study, the researcher was a key instrument of data collection. The main research instrument was a semi structured questionnaire seeking residents' perceptions on solid

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waste management. A questionnaire was used as a data collection instrument in this study due to its ability to gather data from a large population within a short space of time.

The questionnaire is ideal for collecting individual perceptions on waste management in Chegutu. The questionnaire captured demographic data namely age and gender. These are relevant in the description and interpretation of findings in the study. For example, waste generation and perceptions towards waste might be different for people of different age groups. A combination of both open-ended and closed ended questions was used. Open ended questions provided for individual initiated responses and the reasons for these responses while closed ended questions were used to confirm insights from literature.

Observation, Interview and document analysis guides were useful for focusing data collection for this study. Using a variety of data collecting instruments has the advantage of triangulating the information to be collected. This idea of triangulating instruments was echoed and supported by Miles and Huberman (1994) who requires it as a strategy to enhance study validity.

2.2 Validity and Reliability

Gilbert (2000) observes that validity is the extent to which a construct measures what it is supposed to measure. It refers to the issue of whether the data collected is a true picture of what is being studied. Chinamasa (2015) concede that validity is a relative and subjective concept depending on whoever is determining it. Gray (2009) concur with Chinamasa (ibid) that validity is the degree to which data in a research are accurate, sound and credible.

To ensure content validity in this study, a questionnaire audit was done. The questionnaire was constantly referred to research questions to make sure that the questions being asked are a true representation of the construct to be measured.

Ambiguity was reduced in the questionnaire due to the pilot study which indicated areas of weakness. These were corrected. To ensure validity in this study, a process of triangulation of various data collection methods was underscored. It compares multiple data sources to arrive at a common theme. To improve validity, the interpretations were sent back to the respondents to ascertain whether they agree with the conclusions drawn.

Chinamasa (2015) advised that qualitative researchers cannot demonstrate that their data are accurate and appropriate. However, efforts can be made to make the data credible. In this study, credibility was observed using observations, triangulation of data and methods. Data interpretations were tested with research participants. Therefore, the credibility of this study was attained and enhanced by data, instruments, methods and participant triangulation.

Denscombe (2010) defines reliability as the neutrality or consistency of the research instrument. Chinamasa (2015) affirms that while validity is focused on study findings, reliability is focused on instruments and data collection methods. By way of contrast, Walliman (2005) describes reliability in relation to human perception and intellect, as the power of memory and reasoning to organize data and ideas in order to promote understanding.

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To enhance reliability in this study, findings are context bound and depict the specific and unique situation of Chegutu Municipality. The study was a representative investigation due to participants from four different wards. These participants are a rich source of information on solid waste management in Chegutu Municipality. The use of multiple sources of data collection and analysis enhanced transferability. The study's findings can be transferred to similar municipalities.

Reliability was observed during interviews through the use of a tape recorder which was played several times to clarify common points before the data are interpreted. When interpreting the data obtained from interviews, the individual who examined the data to find out whether all questions have been answered properly was different from the one who edited and coded the data.

2.3 Population and Sampling

In this qualitative study, purposive sampling of 65 residents from 9 wards, a focus group of 15 respondents, five municipal workers and 18 vendors was done. These participants are directly involved in solid waste generation, collection and disposal. They are rich sources of the required variable which is residents' perceptions on solid waste management.

Data were collected from residents of Chegutu wards four to twelve. These nine wards formed the sampling frame or research sites. They have the highest population in Chegutu, they experience problems associated with waste mismanagement hence very rich sources of the study's variables. Vendors in the residential areas were included because they generate huge amounts of solid waste. Five employees were chosen from the Refuse section of Chegutu Municipality. Their inclusion was based on the perceived richness of their experiences on residents' perceptions on solid waste management. They were rich sources of municipality perception.

2.4 Observation Guide

In this study, the researcher used an observation checklist to collect data through observation. The researcher made use of field notes, photographs and videos. These were scrutinized during post observation analysis.

The researcher gathered primary data by directly observing residents' actions from different sites. Observation yielded information which people are normally unable to provide. Observation was used in this study to deduce and interpret residents' feelings, meanings, patterns and emerging themes. The data were corroborated with information obtained through interviews and questionnaires.

Observation enabled the generation of first-hand data that is uncontaminated by factors standing between investigators and the object of research. Observation entail some form of recording hence it provided a permanent record of observed behavior. Observations allowed further analysis and subsequent comparisons across time or locations to be carried out. Therefore, observation in this study helped to collect supplementary data used to interpret and qualify

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findings obtained by other methods. Observation enhanced the quality of evidence available to the researcher.

2.5 Interviews

Nyawaranda (1989) avers that interviews help to access information that cannot be accessed by observation. In qualitative research, interviews are a rich source of information about people's perceptions, emotions, feelings and experiences. Interviews were conducted in this study due to the following benefits:

1. Enable researchers to probe and ask respondent to explain answers.

2. Researcher is able to make further enquiries as follow up to issues raised by respondent.

3. The respondent is able to express perceptions hence the researcher can complement verbal with non-verbal expressions

4. There is flexibility in the questioning process and the researcher can clarify issues that might be unclear.

2.6 Focus Group Discussions

Vendors form a special group of participants when it comes to solid waste generation and management hence their perceptions are pertinent to the study. Vendors are composed of literate and illiterate people. They are too busy to complete a questionnaire. To gather their perceptions, the researcher grouped the vendors and carried out focus group discussions.

The following questions were used to initiate discussions with vendors:

i) What do you consider as waste in Chegutu?
ii) How can you as residents' assist to reduce waste?

Participants' views were recorded. The researcher facilitated the group discussions by identifying common views and asking specific groups to explain their unique answers.

2.8 Data Analysis and Interpretation

Lincoln and Guba, (1985) advises that data collection, analysis and interpretation are simultaneous and continuous processes. In this study, data was analyzed simultaneously and iterative with data collection and data interpretation. Coding procedure was used to interpret, infer and deduce participants' meaning. In order to determine trends in the responses, ideas, statements and phrases were clustered into emerging themes. Responses were decoded against their respective themes. Braum and Clarke (2006:05) coin that thematic analysis enables the researcher to identify analyse and report research question themes. It also enabled the researcher to minimally organize and describe the data set in detail.

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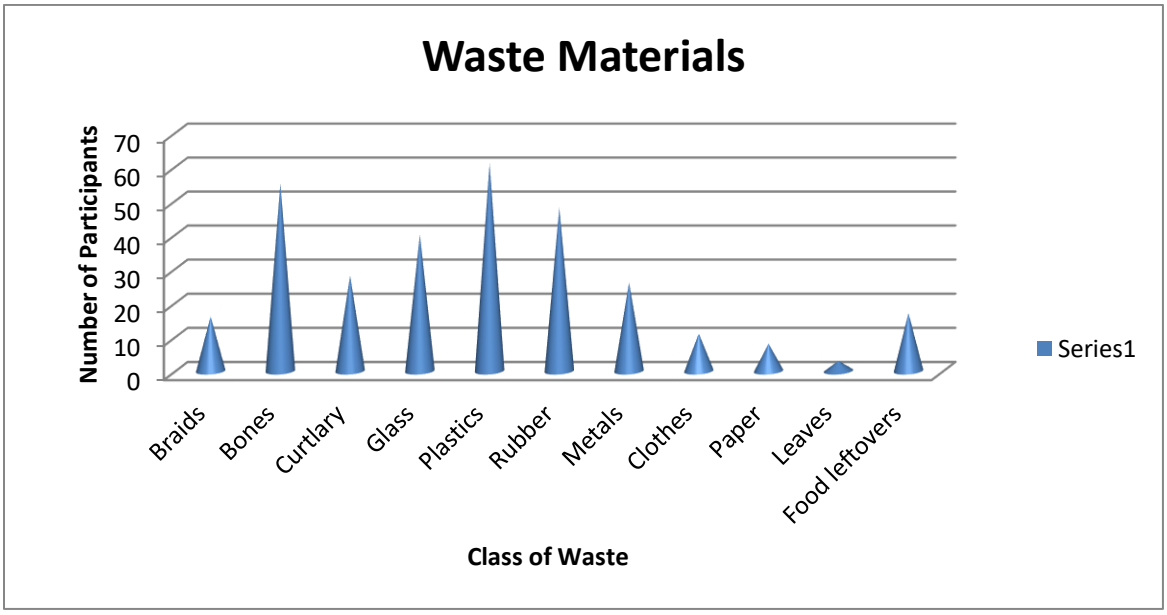
3. FINDINGS AND DISCUSSIONS

Participants' Age Distribution N = 65

STEM	LEAF	Total
2	1, 1, 2, 2, 3, 3, 4, 4, 4, 5, 5, 6, 7, 8, 8, 8, 9, 9	18
3	0, 0, 0, 1, 2, 3, 3, 4, 4, 5, 6, 7, 9	13
4	3, 4, 5, 6, 7, 8, 8, 9, 9	9
5	0, 2, 3, 7, 8, 9, 9	7
6	0, 1, 2, 3, 4, 5, 6, 6, 6, 6	10
7	5, 5, 6, 7, 8, 9	6
8		
9	3, 5	2
	Totals	65

The minimum age of the participants is 21. They are all adults whose perceptions can be relied upon. The distribution is positively skewed with a mode of 66 years. The majority are in the 20 to 30 years group. These are economically active and contribute seriously to waste generation and management. There are two outlier cases at 93 and 95 years. These were very rich sources of the historical developments of waste and waste management in Chegutu.

3.1 Residents' perceptions of Waste N = 65



The bar graph shows that the majority of residents (94%) identified plastics and bones as the major forms of waste. One can attribute this distribution to the nature of packages that most food items now use. The possibilities of more families eating meat regularly can contribute to bones

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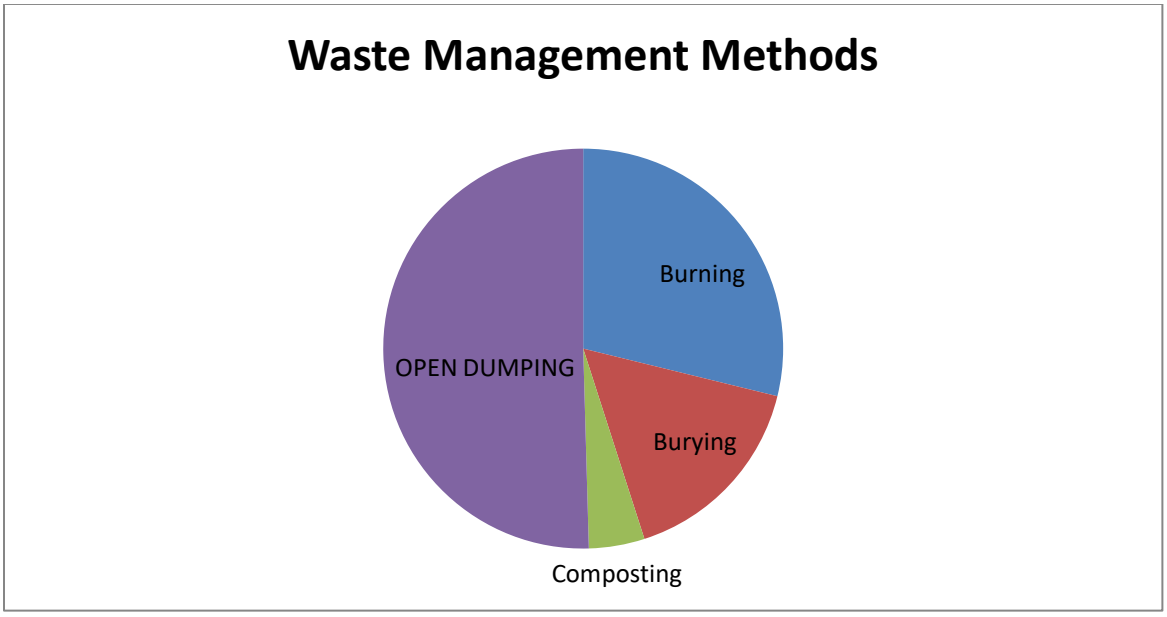
being a major waste. Plastics are in different colors, do not decompose when buried, hence are very visible. Similarly, glass, cutlery, bones and rubber do not decompose hence are a visible waste for a long time. Metal waste was itemized as being composed of old stoves, pots and the bulk being broken car parts.

There is a visible low submission to leaves, paper, clothes and food left overs as waste. These can be managed easily by composting or burning hence not considered much as waste material.

Residents' perceptions of waste are limited to solid waste. Nobody identified liquid waste such as oil and fuel spill overs in their tarred streets hence there are no management methods suggested for them.



The majority of residents managed waste by dumping on open spaces in the streets. What is worrying is the fact that, even in places where council provided bins, there is litter around the bin. Residence would not have taken the initiative to make sure that they drop their litter inside the bin. Note also that bones, cutlery and glass are not destroyed by either burning or composting. Incineration is only done at Chegutu hospital. Land-filling is mainly done by Chegutu council. Efforts to manage solid waste have often been at the expense of the environment.

The study established that only 1.5% of participants were of the opinion that residents should bear the responsibility of managing solid waste. The majority of respondents 98.5% indicated that they felt the best authority to bear responsibility should be the municipality (local authority). In a focus group discussion, some respondents were recorded as saying:

> *"The municipality is taking our money for that reason so they have to collect the waste and it's their job to worry about waste, for as long as we pay that is the way it should remain!"*

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In support of this view point that the municipality must take responsibility, a respondent was recorded to have said:

> *"We* (residents) *don't know anything about waste management so they* (municipality) *are the people who have been doing that since independence in 1980 so they have to continue they have experience and they know better*".

3.2.1 Employees' perceptions

The critical shortage of sufficient personnel was reported as a major hindrance to the provision of a sustainable solid waste management system in Chegutu town. Although at the managerial level, the municipality has adequate skilled personnel who have relevant professional qualifications, the number of staff at the operational level is grossly inadequate. For instance the town has only 10 street sweepers. This number has remained unchanged although over the last 3 years, the town has increased the number of streets considerably. This has in turn increased their workloads hence the Environmental Health Technicians suggested that the ideal number of street sweepers would be 20, which is double the current staff complement.

According to the findings from the key informant interviews done with staff from Chegutu refuse section, the municipality's waste collection efficiency is estimated at 70%. The projected waste generation is approximately 73 000 tons annually. Estimated collected waste is 511 00 tons per year (Chegutu Municipality Refuse Management Records 2018: 1). These figures correspond with figures elsewhere in developing countries, for instance the waste collection efficiency of 70% agrees with the findings of UNEP (2015) which show that 30-60% of solid waste in developing countries is uncollected.

3.3 Management strategies

The study proposed a model of integrated sustainable solid waste management that included a hierarchy of methods of reduce, recycling, composting, incineration and land filling, with stakeholder participation playing a key role in all these methods. The model of integrated sustainable solid waste management proposed was derived from literature and studies including Bartone (2000) and Puopiel (2010).

3.3.1. Waste Reduction

Respondents to the survey said that they take measures like cooking less food, recycling and reusing some of their solid waste and composting in order to reduce waste that is collected for final disposal. There were no deliberate actions or practices by the municipality to promote source reduction of waste in Chegutu.

Literature reviewed converged on the role and importance of source reduction in a sustainable solid waste management system. Denison and Ruston, (1990) viewed source reduction as actions performed to reduce volumes and toxicity of solid waste before processing and disposal.
Kreith, (1994) concurr with Puopiel (2010) that reusing of container bags, reducing buying habits, and reducing the use of disposable products are some of the ways to reduce waste

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generation at source. However, policies on waste management in Zimbabwe are silent on source reduction or practical steps that can be followed by local authorities or households to reduce waste. Reducing buying habits requires an analysis of those habits first.

3.3.2. Composting

Composting involves biological decomposition of biodegradable solid waste under controlled aerobic conditions to a state that is sufficiently stable and palatable for handling (UNEP, 2009). Other scholars that include Puopiel (2010) and Zerbock (2003) asserted that composting was a low income technology strategy which is sustainable and suited to low income areas like Chegutu as composts do not require expensive engineering and are easy and cheap to maintain.

Findings from the study revealed that some composting is done in Chegutu by individual households; nevertheless it is not systematic and is done at a very low scale. Only 36.3 % of the survey respondents said they do composting. Given that about 29% of solid waste generated in Chegutu is agricultural waste there is scope for composting as a good strategy to reduce waste.

The EIA policy document identified composting as one of the prescribed activities under the management of municipal solid waste but does not propose practical steps in which this should be done.

4. RECOMMENDATIONS

On the basis of these findings the study it is recommends a participatory model involving; reduce, separate, recycle, composite and bin for council collection and land filling. This system can be implemented as follows:

1. Educate Chegutu residents on all types of waste, their generation and management methods. This can be the responsibility of ward councilors.
2. Council can provide house five cluster bins for each cluster of five houses. Residents can dump metals, glass and bottles, bones and paper in the designated bins. This is the separation which facilitates recycling.
3. Council can locate organizations which recycle each of these; metal, bottles, bones and paper.
4. A volunteer resident can manage each cluster bin. The member communicates with the recycling argent, sells the contents of each bin and gets say 30% of the sells. A nearby school or hospital gets 30% and council gets 40% for development projects.
5. Each house hold can have a garden, be taught how to do composite flower or vegetable beds. Use organic waste from leaves, paper and food left overs for their manure.
6. Solid waste such as clothes, rubber, plastics and braids can be managed by burning.
7. Any other waste can be left for council to collect and destroy by incineration or land filling, depending on the nature of the waste.

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