AN EVALUATION OF SOLID WASTE MANAGEMENT WITH SPECIFIC REFERENCE TO THE MUNICIPALITY OF MAPUTO CITY (MOZAMBIQUE)

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by

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DECLARATION

I, Elsa Alberto Pondja Manhica, declare that the contents of this thesis represent my own work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions.

Elsa Alberto Pondja Manhica July 2012

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Signed

ABSTRACT

One of the greatest problems Mozambique is currently facing is the increased involvement of sectors in producing large amounts of solid waste on a daily basis. These sectors are involved in activities that take place in homes, industry, mining, agriculture and commerce. As a result, this problem needs to be treated efficiently by the Municipality of Maputo. Solid waste produced each day in Maputo is not only an aesthetic problem but poses a threat to citizens' health and it damages the environment. With the production of large amounts of waste each day, the Municipality of Maputo is faced with an ineffective solid waste management system. This ineffectiveness is due to a number of reasons, which include lack of resources, inadequate or no staff training, poor management of solid waste by both the municipal and the government, inappropriate laws to regulate solid waste collection, poor control of such laws in terms of removal and disposal of the waste, using past colonial methods for dealing with solid waste and poor community involvement, The problem not only affects the Municipality of Maputo but it also affects both citizens and the environment.

Ineffective solid waste management is linked to poor management, lack of resources, poor staff training, and unskilled public officials.

The city gets dirtier as the amount of waste increases day by day, due to the fact that citizens living in rural areas have immigrated to the city looking for work after the civil war, which took place between 1977 and 1994. Emerging from a severely damaged war-torn economy, Mozambique is still in the process of reconstituting many of its public institutions.

Communities, local government, industry, commerce, civil society, academics and religious organisations can no longer turn a blind eye to poor solid waste management. Instead, they need to join to fight against poor management of solid waste.

The current situation demonstrates that too few individuals, non-profit organisations and private companies are involved in solid waste management activities. Effective solid waste management can only be effective if it engages all producers of waste and captures the policy strategies, planning and challenges of sustainable development.

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ABBREVIATIONS

CERCLA	Comprehensive Environmental Response Compensation and Liability Act
AGRESU	Deutsche Gesellschaft für International Zusammenarbeit
DANIDA	Danish International Development Assistance
FUNAB	National Fund of Environment
NCTM	National Council of Teachers of Mathematics
ASSADPAM	Association of South African Departments of Public Administration and Management
NECSA	Nuclear Energy Corporation
IWMSA	Institute of Waste Management of South Africa
NEAP	National Environmental Plan
EDM	Electricity of Mozambique
CBOs	Community Based Organisations
RAs	Residential Associations
UNSD	United Nations Statistics Division
DEAT	Department of Environment and Tourism
DWEA	Department of Water and Environmental Affairs
RSA	Republic of South Africa
JICA	Japanese International Cooperation Agency
UNEP	United Nations Environmental Protection Agency
UNDP	United Nations Development Programme
SSPPS	Small Scale Private Providers Service

CHAPTER 1

GENERAL INTRODUCTION

1.1 BACKGROUND TO THE RESEARCH PROBLEM

Mozambique is a Southern African country located in south-eastern Africa, bordered on the north by Tanzania, on the east by the Mozambique Channel of the Indian Ocean, on the south and south west by South Africa and Swaziland, and on the west by Zimbabwe, Zambia and Malawi. The capital is Maputo, with approximately 1 244 227 million inhabitants. The city is surrounded by Maputo province, but administrated as an independent province. Maputo is located on Delagoa Bay. Maputo City is divided into five urban districts, which are further divided into neighbourhoods (bairros), which are in turn made up of several local areas (quarteirões) (Marques, 1997:37).

One of the major problems facing the Municipality of Maputo City is the management of [1]solid waste, which is linked to poor management, a lack of resources, poor staff training and unskilled public officials (Comiche, 2006:25).

Maputo City gets dirtier as the amount of waste increases daily. This is attributed to citizens living in rural areas who migrated to the city looking for work after the civil war, which took place between 1977 and 1994. In addition, municipal equipment used in waste removal is also at

[1] Solid waste management is defined in the Glossary of Statistics (UNSD, 2001) as supervised handling of waste material from generation at the source through the recovery processes to disposal.

the end of its useful life and there are no funds available for its replacement (Schwalbach, 2008:10).

Emerging from a severely damaged war-torn economy, Mozambique is still in the process of reconstituting many of its public institutions. Local authority legislation was only passed in 1997 and the Municipal Council of Maputo City (Conselho Municipal da Cidade de Maputo) was still developing as an organisation. Furthermore, problems were compounded by the inheritance of a poorly functioning or non-existent infrastructure for which new systems were required with limited resources (Rosário, 2003:3).

Yap (1999:3) states that the management of solid waste of household, institutional, commercial and industrial sectors could be effective if it captures the policy, planning and challenges of sustainable development. While waste-management issues frequently gave rise to tension, it also provided opportunities for creative solutions. At a national level, waste-management issues created tension between waste generators and community residents and between the formal and informal economic sectors. At the level of industry, waste-management issues posed difficulties in regulatory compliance against profitability goals (Yap, 1999:3).

Therefore, this study aimed at a comparative approach to solid waste management with specific reference to the Municipality of Maputo City.

1.2 RESEARCH PROBLEM

According to a Regional Status Report, dated May 2002 (Regional Office for Africa, 2002), African countries are facing serious problems related to solid waste management and environmental pollution due to rapid growth in urbanisation and industrialisation. Solid waste

and the emission of air toxins are a growing concern for African industries. According to the Mozambican National Cleaner Production Centre Report, dated May (UNEP, 2002), an equivalent of about half a million ton of fossil fuels are burnt in Mozambican industrial facilities yearly.

In February and March of 2000, Mozambique was devastated by heavy rains, which led to floods affecting approximately one million people, of whom most were poor (Mendel, 2006:6). The land on which they reside is in low-lying areas and when it rains heavily, water accumulates in those areas. Kruks (2006:1) argues that the floods that occurred in Maputo in 2000 set in motion a series of events that intensified Maputo's solid waste-management pressures. Kruks (2006:9) contends that "the flooding was particularly acute in Maputo's low income neighbourhoods where drainage, sanitation, and garbage collection are highly inadequate".

The consequences of the abovementioned floods were that food prices increased dramatically, as there was a shortage of food products, and infrastructure such as schools, hospitals, houses, crops, roads, railways and telecommunication networks were damaged. In addition, solid waste remained uncollected for long periods of time, as flooded areas limited access by waste-collection vehicles. Furthermore, the floods dispensed most of the waste into different areas of Maputo City, making it difficult to assess where waste had been transported. In addition, the waste contaminated many rivers, which caused illness among many citizens due to polluted drinking water (United States Agency for Development, 2002).

In 2000, the Municipality of Maputo City published a notice imposing a cleaning tax on residents. This was bundled with the electricity account, as the Electricity of Mozambique

(Electricidade de Moçambique) was introducing pre-paid meters. However, despite residents paying a 'cleaning tax', large containers full of rubbish still overflowed onto main roads.

During 2001, the Small-scale Private Providers Service (SSPPS), along with Maxaquene, developed a waste-management system for 'primary' garbage collection (Kruks, 2006:11). In this system, residents paid a small fee for the service of SSPPS-distributed people with handcarts sent to each household to collect waste and dispose of it in dumpsters outside the bairros. Thereafter, the city was responsible for the collection of waste from the dumpsters for onward transport to municipal dumpsites. Primary collection services occurred for the first time in these areas. Previously, residents were expected to carry waste to dumpsters, which were a substantial distance from their homes (Kruks, 2006:11). This initiative was instituted because numerous individuals resorted to illegally disposing their waste in informal areas all over their neighbourhood or in drainage ditches, endangering the health of residents and increasing the threat of flooding (Kruks, 2006:11).

In light of the foregoing, the core problem this study addressed is the ineffective management of waste in the Municipality of Maputo City.

1.3 OBJECTIVES OF THE STUDY

The Municipality of Maputo City has adhered to many projects and has developed many programmes in order to improve solid waste management. This research study sought to evaluate solid waste management within the Municipality of Maputo City.

The objectives of the study were to:

- provide a theoretical assessment of solid waste management in countries such as Kenya and South Africa in order to learn lessons from their waste-management experiences. The two countries were selected as they allowed for a comparative assessment of solid waste management in developing countries;
- forward the waste-management legal framework of the Republic of Mozambique;
- investigate the process and policy of solid waste management in the Municipality of Maputo City (Mozambique); and
- develop a set of recommendations and conclusions for improved solid waste management by the Municipality of Maputo City.

1.4 SIGNIFICANCE OF THE STUDY

The study will assist the Municipality of Maputo City, specifically the Department of Municipal Services, Health and Salubriousness (Direcção Municipal de Saúde de Salubridade), to improve solid waste management in the country in general.

1.5 KEY QUESTIONS PERTAINING TO THE RESEARCH

The questions pertaining to the research are the following:

- What are the causes of ineffective solid waste management by the Municipality of Maputo City?
- What are the most effective ways in which municipalities can manage their solid waste?
- Which measures are in place to improve solid waste management in Maputo City?

1.6 LITERATURE REVIEW

Hardy (1999:41) argues that an appropriate literature review is characterised by a logical flow of ideas, current and relevant references with a consistent, appropriate referencing style; good use of terminology; and unbiased and comprehensive views of the previous research on the topic.

A number of purposes for solid waste management were identified from the literature. Nyang'echi (2002:33) states that the major purpose of effective solid waste management is to provide the necessary information to design strategies for effective waste disposal.

According to Armmons (2001:12), the management, collection and storage of solid waste in towns are mainly the responsibility of the local authorities. The local government provides dustbins to individual users and institutions and chooses the types of dustbins to be used in the towns, but the bins remain the property of local authorities. However, the users of dustbins have to surrender the worn-out and dilapidated dustbins when collecting new ones. Also, where the tenants and landlords cannot agree as to who should buy the dustbins, the local authority intervenes. In such case, the local authority charges the person who is occupying the premises.

Bambo (2008:2) maintains that a requirement for the Municipality of Maputo City to manage solid waste is to involve partnerships with other private and public institutions, as the money obtained through the garbage collection fee is insignificant.

Magaia (2008:2) argues that when the Municipality asks the central government to increase amounts on the local government budget and increase rubbish-collection fees, there are managers who question the necessity for increasing the budget and fees. Their concerns mostly relate to the question of why the budget and fees should be increased if the Municipality does not manage

solid waste properly. Magaia (2008:2) states that what is required is to draw best strategies and plans that can be used to collect rubbish, and to follow the principles of good management.

Newell (2005:81) states that excellence in local government means involving citizens in government to help define and plan the services that are most critical to the community. It means reaching out to all citizens – rich, middle-class and the poor – and ensuring that city services are equitable and affordable, creating a dynamic organisation that is flexible and responsive to the rapid social and technological changes occurring throughout the world and protecting the environment. It means nurturing neighbourhoods and making the community safe. It means recruiting and maintaining a well-educated workforce representative of the community. It means establishing and adhering to high ethical standards. It means managing the institution within its financial limitations. It means giving citizens what they want from government.

Houston (2007:9) states that state incapacity and citizen responses to the challenges of solid waste management in Maputo is another area for investigation, where informal organisations must emerge and international agencies must introduce models for local government to initiate public-private partnerships. The different organisational structures for solid waste management in Maputo and the extent of the local authorities' engagement with citizens in the peripheral areas can be explored. Policy and practice in the Municipality of Maputo City should be investigated and analysed in terms of the developing international discourse for urban governance.

1.7 RESEARCH METHODOLOGY

Walliman (2001:225) identifies two research approaches: qualitative and quantitative. The

research incorporated a qualitative research approach, which will be discussed below.

1.7.1 Qualitative research

Qualitative research is a method that focuses on description, interpretation, meaning, narrative accounts and context (Lyman, 2000:332).

Qualitative research allows for the description of events, situations and circumstances without using numerical values. It further allows for interpretation and understanding of a phenomenon, in this case solid waste management. The description of events involves looking for examples of the problem that participants experience and seeing how it affects them (Lyman, 2000:332).

Huberman (2001:7) states that qualitative research embraces the complexity of the experience by encouraging participants to convey the depth and scope of their perceptions, feelings and thoughts.

A qualitative research approach as elucidated above thus proved apt for the study.

1.7.1.1 Data-collection methods

The study employed the following data-collection methods:

a) Interviews

An interview is an interpersonal interaction where one person asks others about their knowledge, beliefs, attitudes and behaviours related to a topic in a face-to-face situation (Kayrooz & Trevitt, 2005:189).

The study included interviews with staff members of the Municipality of Maputo City, specifically in the Department of Municipal Services, Health and Salubriousness. The staff of the

Municipality of Maputo City consists of 259 employees. From the staff component, a sample of 25 participants was randomly selected. A sample is seen as focusing on a smaller portion of the population, in this case the full staff complement. Random sampling was used so as to allow each member of staff to have an equal opportunity to participate in the study. Rosnow and Rosenthal (2008:16) concur with this notion.

Appointments were set up telephonically. The interviews were conducted and recorded in Portuguese and the responses were translated into English. The researcher had to design open-ended questions, arranged in a logical order, in order to obtain detailed responses. The researcher asked the same questions to each participant and followed the same order. The answers were transcribed for analysis. In this way, the researcher was able to ask questions directly and record the responses immediately.

Assurance in terms of confidentiality was given to all participants to protect their identities.

b) Focus group discussions

A focus group discussion is a research tool used to get more participants involved in discussions where perceptions, opinions, comments, beliefs and attitudes are brought together in order to obtain new ideas and learn more about issues (Struwig & Stead, 2001:99). This tool proved apt for the study.

From 150 participants, a sample was selected with the intent to assess feelings, perceptions and comments regarding waste management in the Municipality of Maputo City from a citizen's perspective. The 150 participants consisted of parishioners from three churches, namely the Assembly of God, Nossa Senhora das Graças and Metodista Unida de Moçambique. The ages of

the participants ranged from 20 to 55. The qualifications they held ranged from a Grade 9 high school certificate to a university honours degree. Out of each church group, a random sample of 10 persons who made up the three focus groups was selected. The sample represented citizens from areas in Mozambique that included Polana Cimento, Alto Mãe and Chamanculo. The researcher acted as a facilitator. The discussions were conducted in Portuguese and the information obtained was translated into English. The focus group discussions took place at the three churches to ensure an environment that is free from noise and other distractions. The aforementioned churches were targeted because it was convenient for the participants to access the selected churches easily due to the proximity of their residences and because the researcher also had easy access to these areas.

1.7.1.2 Analysis and interpretation of the findings

The purpose of conducting a qualitative study is to produce findings. Patton (2002:432) states that qualitative analysis transforms data into findings, and places the findings in a structured form. Stemler (2001:1) states that content analysis is a methodical procedure for reducing many words into few content categories.

Before analysing the findings, the data had to be presented clearly in a descriptive way, making reference to field notes and other resources. Once all the data had been collected through the aforementioned interviews and focus group discussions, the information was organised, coded and categorised. Analysis was done manually, and interpretation was done by making a clear distinction between what the data said (descriptive data) and what the data meant (interpretation).

1.8 DELINEATION OF THE STUDY

The study was undertaken within the Municipality of Maputo City, specifically at the Department of Municipal Services, Health and Salubriousness (Direccão Municipal de Saúde de Salubridade).

1.9 CLARIFICATION OF BASIC TERMS

1.9.1 Solid waste management

Solid waste management refers to "supervised handling of waste material from generation at the source through the recovery processes to disposal" (UNSD, 2001:1).

1.9.2 Solid waste

Solid waste refers to the unwanted remains, residues, discarded materials or by-products that are no longer required by the initial users. These materials are the by-products of human activities. Such activities include the processes of preparation, manufacturing, packing, unpacking, and construction and renovation of structures (Nyang'echi, 2002:3).

1.9.3 Street waste

Street waste refers to accumulated waste on the roads and streets. Street waste includes, for example, dust, grit, litter, cinder, motor parts, leaves, waste paper and plastic bags (Scott, 2005: 5).

1.9.4 Municipal Assembly

Municipal Assembly refers to the representative body of the municipality endowed with deliberative powers (Republic of Mozambique, 1997:10).

1.9.5 Communities

Communities refers to groups of interacting organisms sharing an environment in a particular human community, intent, belief, resources, preferences, needs, risks and a number of other conditions (Gandy, 2003:18).

1.9.6 Environmental management

Environmental management refers to the rational and sustainable administration and utilisation of environmental elements, including the re-use, recycling, protection and conservation of these elements (Reichenberg, 2004:22).

1.9.7 Hazardous waste and residues

Hazardous waste and residues refer to substances or objects to be eliminated, or where there is the intention to eliminate or which must, by force of law, be eliminated. Hazardous waste carries risks by virtue of characteristics such as inflammability, being corrosive, explosive, toxic, infectious or radioactive or any other characteristic that constitutes a danger to the health or life of individuals (Dog, 2006:3).

1.10 ETHICAL STATEMENT

The confidentiality of the data gathered and the anonymity of the participants were ensured by not requesting any personal details from the participants. The sole purpose of using the data gathered for research was communicated to the participants on the front page of the data-collection tool. The choice of not answering any of the questions was respected.

The researcher contended that this research ethics statement ensured the research was conducted on good ethical grounds.

The researcher further agreed to conduct the research in line with the published ethical rules of the Association of Southern African Schools, the Department of Public Administration and Management and the Cape Peninsula University of Technology.

1.11 ORGANISATION OF THE STUDY

The study is organised into the following six chapters:

Chapter 1: General introduction

The chapter provided a background to the research problem, a clarification of basic terms, a statement of the research problem, the objectives of the study, key questions pertaining to the research, an overview of the literature review, research design, the delineation of the study and the significance of the study.

Chapter 2: Theoretical overview of solid waste management in Kenya and South Africa

The chapter entails a theoretical assessment of solid waste management in Kenya and South Africa.

Chapter 3: Legal framework of the Republic of Mozambique pertaining to solid waste management

The chapter discusses the legal framework of the Republic of Mozambique pertaining to solid waste management.

Chapter 4: An investigation of solid waste management in the Municipality of Maputo City

The chapter investigates solid waste management in the Municipality of Maputo City specifically.

Chapter 5: The evaluation of solid waste management in the Municipality of Maputo City

The chapter discusses the research approach followed in evaluating solid waste management by the Municipality of Maputo City in particular.

Chapter 6: Recommendations and conclusions

The chapter provides a set of recommendations and conclusions for improved solid waste management by the Municipality of Maputo City.

CHAPTER 2

THEORETICAL OVERVIEW OF SOLID WASTE MANAGEMENT IN KENYA AND SOUTH AFRICA

2.1 INTRODUCTION

The chapter provides an overview of how solid waste is managed in countries such as Kenya and South Africa. The countries were selected to enable the researcher to draw lessons from these countries' experiences. Solid waste management is a major issue that is affecting many urban areas around the world, especially in developing countries. As Kenya and South Africa are considered developing countries, they were selected to get a clear understanding on how solid waste is managed in these countries and how important aspects of their waste-management practices can be used in Mozambique.

2.2 SOLID WASTE MANAGEMENT IN GENERAL

All people around the world produce waste that comes from the remains of food, cans, tins, metals, old cloth, discarded objects, packing and other waste materials. This waste has to be managed. Kerski and Ross (2005:271) argue that in the past, people burnt their waste, dumped it in the ocean, or buried it in holes in the ground. However, such practices lead to ecological problems, including air pollution, contamination of soil and water, infestation by rats, and other problems.

Solid waste management involves a number of strategies. Kerski and Ross (2005:273) state that

one of the most effective strategies adopted to reduce the amount of waste is source reduction, which is done at the place where waste is first produced. This is the most important form of waste management, as it reduces the amount of waste to be managed and conserves resources used to make new products. The second strategy is to reuse products several times. By reusing materials from consumption instead of throwing them away, the amount of waste is reduced. The third strategy is to recycle. Recycling involves the collection and separation of waste materials and their subsequent reuse or processing into a usable product. The process also helps to reduce the total amount of material that must be handled as waste. However, these approaches do not eliminate waste completely, so responsible solutions have been put in place. Kerski and Ross (2005:271) highlight two preferred options that have been created as solutions to manage solid waste. This involves the use of sanitary landfills and incinerators to replace old-fashioned dumps. Sanitary landfills have been created to prevent contamination of soil and groundwater.

Current landfills are lined with plastic and clay to prevent seepage. Drains are used to collect and carry away water containing dissolved chemicals for treatment.

Refuse is alternated with layers of earth to prevent the wind from blowing the waste around and to discourage foraging by animals. When an area is filled, it should be covered with clay, earth and then landscaped for farming to avoid erosion. Kerski and Ross (2005:270) argue that covering the waste helps to contain it and prevents decomposition through exposure to oxygen.

The major alternative used in the solid waste-management field is incineration, which involves the burning of waste. Incineration reduces the volume of waste by 80 to 90%, allows the neutralising of some hazardous waste and provides the ability to produce electricity (Ratje, 2004:33). Although incineration and sanitary landfills have benefits, there are drawbacks as well.

Incineration poses a threat to human health through the release of metal particles into the air, which over time can cause birth defects or cancer. Also, while the total volume of waste is less, incineration creates ash, which has to be put somewhere. In addition, incinerators are expensive to build and operate because they must be fitted with expensive scrubbers to clean the smoke before release.

The major problem that both landfills and incinerators share is the question of location, because people do not want them near their homes.

While current approaches to solid waste management are better than in the past, when waste was literally thrown out through the window, the new approaches have their own problems.

According to Fant (2011:1), good environmental stewardship requires "a proactive approach". Miller (2011:1) highlights that good environmental stewardship requires that local authorities be responsible and respectful and manage resources and waste in an appropriate way. Ratje (2004:74) argues that good environmental stewardship requires that everyone should do what they can to keep things from becoming waste in the first place. The management of solid waste and resources must be accompanied by the development of best practices, designed programmes and policies. Effective solid waste management requires that everyone be involved and avoid that everything end at the dumpsite. Effective solid waste management helps to protect the health of the population and promotes the quality of life of everyone.

2.3 SOLID WASTE MANAGEMENT IN KENYA AND SOUTH AFRICA

This study examined solid waste management in Kenya and South Africa to learn lessons from

these countries' experiences, as alluded to earlier.

2.3.1 Solid waste management in Kenya

The Republic of Kenya is one of the African countries where communities generate large amounts of domestic waste, consisting of food waste, broken tools, utensils, old clothing and other materials. The domestic waste requires collection and disposal while agricultural waste is absorbed into the natural cycle (Topper, 2005:2).

Solid waste management has four main components: collection, transportation, and re-use or recycling, and treatment or disposal (Tanner & Ljung, 2006:1). In Kenya, private companies and individuals collect and separate waste. Industries and individuals transport waste to the designated dumpsite. Industries use vehicles to transport waste, while individuals use tractors, trailers, open tippers and compaction vehicles, depending on the size of the city and the waste. The vehicles used are not covered and plastic papers blow away during transit.

In addition to managing solid waste, most Kenyan residents re-use products several times, where waste material is returned to the plant for further use instead of using new material as input material. Kenya recycles materials by means of putting waste back into use. Recycling is a process that helps to save resources and to reduce the environmental impact. For example, Kenyan residents use empty plastic ice cream containers to store vegetables and other products (Topper, 2005:3).

The City Garbage Recyclers sort Nairobi's rubbish, which they turn into useful and profitable products. This process allows the City Garbage Recyclers to make money and to create jobs for

young people (Topper, 2005:3). Although there are many methods to treat waste, little waste in Kenya gets collected. Kenya has the capacity to collect only 25% of waste generated every day (Michieka, 2005:4). Residents living in slums and unplanned settlements do not benefit from waste-collection services (Topper, 2005:20).

Collected waste is disposed of in open dumpsites. A lot of waste is, however, never collected, but dumped or burned locally in open spaces. This is due to the fact that sanitary landfills and other solid waste-disposal practices are expensive (Michieka, 2005:11).

2.3.1.1 System of governance in Kenya

Governance refers to various ways in which social life is ruled, ordered and coordinated Heywood (2007:450) maintains that there are connections and interactions between national, provincial and local authorities and the public. Doyle, Waldt, Niekerk, Knipe and Du Toit (2002:64) state that governance is responsible for making decisions and undertaking actions to improve the general welfare of a society by means of delivering best service.

Central government, local authorities and the senior management of every department are responsible for carrying out the decisions and undertaking actions of solid waste management. In most Kenyan local authorities, the systems are centralised. Although they have power to govern, local authorities face difficulties and limitations when making decisions. To make decisions they rely on the senior management of every department, which is time-consuming and results in the delay of processes in the discharge of services as well as poor service delivery (Rotich, Henry, Yongsheng, Jun & Dong, 2005:94).

2.3.1.2 Strategies to combat waste in Kenya

For solid waste management to be managed efficiently, the application of a number of strategies is required. To combat waste, Kenyan local authorities have adopted the following strategies: reduce, re-use and recycle. To reduce waste, Kenyan citizens give attention to what they consume. Products are bought in bulk to reduce the amount of packing, and returnable or reusable containers are also chosen. The product is re-used several times and if any product cannot be used again, they find someone who needs the product for use (Rotich et al., 2005:98).

Artists and educators use recycled materials to inspire the next generation to apply the process. For example, children at Leratong Crèche use chairs and tables that have been made from recycled materials, and they play with paper mâché fruits and vegetables as educational toys (Rotich et al., 2005:98). The local artisan groups (such as Jua Kali) weave plastic bags into beautiful mats, hats and handbags, which are then sold to the public. They also resell old and disposal items.

The three methods are vital, as community groups, local government and private companies can use the various methods to reduce the amount of waste and provide jobs for a considerable number of young people.

2.3.1.3 Staff

To manage solid waste, local authorities need people who are the lifeblood of the institution as resources. These people work to satisfy the institution's and their needs and to reach the institutions' goals. Smith, Cronje, Brevis and Vrba (2007:295) argue that staff are resources that

make local authorities function. Without people, local authorities cannot reach the objectives which they have been created for.

Local authorities in Mombasa, Nairobi and Kisumu have too many poorly trained and unqualified staff. The local authorities often face financial difficulties in paying salaries. Consequently, every year, employees embark on strikes, demanding due wages (Topper, 2005:23).

The staff also face difficulty in measuring and keeping data records on relevant production. This leads to limited enterprise capacity for new and innovative ideas. In addition, staff at both levels, central government and local authorities, face lack of experience, lack of accountability and lack of decision-making authority in addition to a heavy volume of work (Topper, 2005:20). There is also a lack of inter-local governmental cooperation in projects, where coordination in planning does not exist. There is negligence in terms of the collection of taxes, dishonesty of revenue collectors, inadequate enforcement authority, weak enforcement of environmental legislation and political pressure on officers to be less aggressive in revenue collection (Topper, 2005:20).

2.3.1.4 Dumpsites

Kenya has only one official dumpsite called Dandora, which is located in Nairobi Eastland, which is in itself inhabited by many people. The dump receives about 2 000 tons of waste each day (Mwelu, 2008:1).

Furthermore, solid waste is disposed of in open dumps, which lack proper environmental pollution control and monitoring. Moreover, the dumpsite in Nairobi does not meet the basic requirements of protecting groundwater from pollution, as it has no liners (Wandera, 2008:3).

In addition, there are many illegal dumpsites. Consequently, there are no controlled dumpsites (Topper, 2005:17). Waste pickers and dealers control the dumpsite, obliging the National Council and private companies to bribe them to get access to the dumpsite. The dumpsite is full and has no transfer facilities (Topper, 2005:17). Consequently, all enterprises use uncontrolled and unhygienic landfills as the predominant mode of disposal. To reduce costs, many generators of solid waste burn waste at the site, causing air pollution problems, while other generators and private waste-collection firms dump waste in illegal places, as an effective monitoring system is lacking.

Residents living around the dumpsite complain about smoke, bad smells and broken glass. They also complain about respiratory and stomach problems among children. Children living near the dumpsite often pick up objects, which might be dangerous to their health (Topper, 2005:28).

2.3.1.5 Household waste

Household waste is waste generated by a household in its daily operations (Smith, 2010:1). In Kenya, individual household waste is placed in containers; however, these containers are only given to higher-and middle-income households. Low-income households make use of communal containers or dumping stations. Household waste is buried in open spaces near the residences. Topper (2005:29) states that some residents also recycle food, plant and organic waste at home. Some Kenyan communities turn it into compost and use it to fertilise soil. Some Kenyan medium class residents put recycled materials into one or two different bins for curb-side collection. Other material is taken to a recycling centre and sorted into pure streams of the same type of material. Each pure stream material is put into a bin and taken to the reprocessing plants (Topper, 2005:9).

2.3.1.6 Industrial solid waste

Industrial solid waste is a combination of compounds (Ishida, 2007:1). This type of waste comes from manufacturing or other industrial processes. Ishida (2007:2) highlights various safety techniques to deal with industrial waste, namely reduction, recycling, treatment, incineration and land disposal.

To treat industrial waste, Kenya uses a variety of techniques, including recycling, where waste generators change manufactured products and materials into other products in order to produce less industrial waste. These products are then sold. Chemical processes are used in order to destroy toxic compounds. While incineration is used to burn some industrial waste, other industrial waste is buried in illegal dumpsites (Ishida, 2007:2).

Some industrial, agricultural and medical waste is all dumped at Dandora, which harms the health of the population and destroys the environment. A survey conducted by the Ministry of Finance and Planning in 2001 indicated that most local industries manage their own solid and liquid waste due to local authorities having no developed technology to deal with all types of waste (Rotich et al., 2005:94).

2.3.1.7 The major generators of industrial solid waste in Kenya

The major generators of industrial solid waste in Kenya are chemical, petroleum, metal, wood, paper, leather, textile and transportation industries. The smaller generators are auto equipment firms, repair shops, electroplaters, construction firms, dry-cleaners and pesticide applicators (JICA, 2005:32).

Table 2.1 shows the percentages in which various types of waste are generated in Nairobi.

Types of waste generated in Kenya	Key	Percentages
Leather	LT	1%
Glass (containers and others)	GL	2%
Rubber	RB	2%
Textiles	TT	3%
Ceramic and soil	C&S	3%
Metal (containers and others)	ML	3%
Glass/Wood	G/W	7%
Plastic (containers and others)	PC	12%
Paper (recyclable and others)	PP	16%
Food waste	FW	51%

Source: JICA (1998)

Davies (2004:55) argues that inadequate management of solid waste pollutes the environment and constitutes a danger to the health and welfare of the public.

Manufacturing is the major producer of the following pollutants in Kenya:

- Pharmaceuticals, with over 30 manufacturing companies producing pharmaceutical pollutants
- The plastics industry, with approximately 100 firms producing thermo-setting, flimsy packaging
- Soap, perfumes, cosmetics, toiletry Ceramics, glass and petroleum

2.3.1.8 Principal actors of solid waste management in Kenya

The National City Council and private commercial companies are the principal actors of solid waste-management services in Kenya (Topper, 2005:18). A small number of other actors, including some industries and bulk generators, store the waste and transport it to the dumpsite themselves. Surveys conducted in 2004 showed that private companies and personal initiatives play a crucial role in the city's waste-collection sector (Topper, 2005:28).

2.3.1.9 Other actors

In Kenya, there are others actors that operate in solid waste management, namely community-based organisations (CBOs), residential associations (RAs), farmers and informal agents. Most of these organisations are engaged in waste composting and picking (Topper, 2005:18)

For example, the non-governmental organisations (NGOs) and international organisations are the ones that support CBOs through training, marketing and the provision of tools. Other institutions that offer assistance in solid waste management are the Foundation for Sustainable Development in Africa, the Uvumbuzi Club, the Undugu Society of Kenya, the Japanese International Cooperation Agency (JICA) and the National Council of Churches of Kenya. There are donor agencies that play a crucial but indirect role by funding the NGOs that assist CBOs in waste picking, cleanliness, recycling and waste composting (Michieka, 2005:30).

2.3.1.10 Ineffective solid waste management

The Administration of Nairobi is facing a crisis. Topper (2005:21) claims that there is confusion between the Municipal Council and the central government due to an absence of clear roles

within the institutions. There is a lack of knowledge, as policymakers are not educated, resulting in ineffective solid waste management.

Most policymakers have not had high school or even tertiary education; they have been appointed as a result of their political power. As a result, they create laws and policies that are not planned or examined carefully. They do not know how the policies might impact the way solid waste management is coordinated and run (Topper, 2005:22).

Furthermore, they may not have been trained in the skills needed to create laws. The policymakers use the power of the mayor in order to gain what they want and to facilitate their corrupt deals, thereby creating corruption, mismanagement and confusion regarding solid waste management (Topper, 2005:23).

In addition, the Municipal Council has failed to implement the legislation on solid waste. The central government has failed that to see the Municipal Council is doing its job. As a result, the administrative system is ineffective, dysfunctional and inefficient, causing the infrastructure facilities to deteriorate (Topper, 2005:23).

Heywood (2007:105) remarks that "a weak government is one that has no capacity to function effectively, with inefficient and corrupt administrative structures that are incapable of implementing regulations and improving the social life of its citizens".

To strengthen solid waste management, the Municipal Council needs to be more efficient and responsive by developing public policy, enforcing laws and delivering public services effectively. New methods of governing should be devised so that the communities are the beneficiaries of effective solid waste management.

2.3.1.11 Causes of ineffective solid waste management

In Kenya, various reasons are attributed to ineffective solid waste management. The major reason is attributed to growing urbanisation (Topper, 2005:23). Another reason is attributed to the expansion of urban, agricultural and industrial activities, which produce large amounts of solid and liquid waste that pollute the environment and destroy resources. Poor performance, inappropriate planning, inadequate political governance, poor technology, weak enforcement, lack of implementation of existing legislation and the absence of economic and fiscal incentives to promote good practice are further reasons attributed to ineffective solid waste management (Michieka, 2005:33).

2.3.1.12 Improvement of solid waste management in Kenya

The local authorities in Kenya feel that there is a need to improve solid waste management. Surveys have been conducted, which indicate that there is a need to create a National Environmental Plan, which will allow local authorities to re-organise, plan and coordinate all aspects related to solid waste management (Shaw & Gatheru, 2007:55).

The Minister for Local Government has ordered the relocation of the Dandora dumpsite, the only existing landfill in Nairobi, to Ruai City to minimise problems, but this is not an effective solution, as the people of Ruai City will then be exposed to a number of diseases. Furthermore, the city is near an airport, so there will be an increase in accidents as birds and flies at the dumpsite will be on the pathway of the planes, leading to airplane crashes (Topper, 2005:26).

When the Municipal Council realised that solid waste performance was poor and that existing private companies had failed to manage solid waste, the Municipal Council decided to involve a

number of CBOs, which included charitable organisations, ethnic associations, welfare societies, village committees, self-groups and residential associations (Topper, 2005:18). Although the Nairobi Council City has involved other actors to operate on solid waste, problems still remain. What is required is a decentralised system that makes use of appropriate planning, adopts good governance and best strategies, improves the budgets, trains the staff, imposes the enforcement of the existing legislation and puts new technologies in place.

Moreover, local authorities have been forced to bring solutions to the problem of solid waste management, which includes using new ideas and best strategies, establishing partnerships with the private sector and involving communities in all aspects related to solid waste management (Kimani, 2001:12).

According to Topper (2004:3), "at the local level solid waste management has attracted a lot of attention so municipalities have instituted specific departments just to manage waste that is produced within their jurisdictions".

Topper (2004:5) adds that the Nairobi City Council has established the Department of Environmental Affairs to manage solid waste management within the city boundaries. This Department has been given power to draw up a specific budget that covers most of the solid waste expenditure. As an example, in the 1998/1999 financial year, expenditures were approximately 19.2% of the Council's total expenditure.

2.3.1.13 Waste-management project

To implement a new waste-management project, local authorities in Kenya have involved community groups, schools and households. This step helps to sort waste out into different types

of materials. The process is done at the source in institutions and households so that people are allowed to reuse or recycle parts of waste themselves. People employed at the dumpsite sort all the waste to facilitate the process (Weber, 2006:2).

2.3.1.14 Privatisation

Privatisation plays a crucial role in the success of solid waste management for a community. Heywood (2007:456) maintains that "privatisation happens when the state transfers assets from the public to private sector, reflecting a contraction of the state's responsibilities".

In Kenya, the Ministry of Local Government has approved the involvement of the private sector through the privatisation of certain services related to solid waste management (Michieka, 2005:18). Burtone (2006:10) supports the idea that with privatisation, Kenya will be able to provide efficient service in the collection and recycling process. Burtone (2006:24) concludes that private companies are more effective than public institutions in providing municipal solid waste services, while Peters (2008:9) concludes that privatisation is a possible way for improving solid waste management. Heywood (2007:457) defends the notion that privatisation includes the shifting of many responsibilities from government to the private marketplace and argues that government should sell off many of its enterprises such as garbage collection, recycling, composting and other solid waste services. According to Heywood (2007:458), "privatisation came to the reliance on private providers of governmental services functioning in a competitive marketplace and giving individuals greater choice in services".

Moreover, there are private companies and CBOs operating in waste collection, garbage collection, recycling and other services, but only residents with a higher-income and upper-

income businesses can afford to pay the monthly fees (Michieka, 2005:4). According to Michieka (2005:26), residents living in the informal settlements cannot benefit from these services due to their inability to pay for the services and the poor accessibility of private companies to reach these areas. Although there are private companies operating in some areas, local authorities have no official policies on the privatisation of waste collection nor do they provide any assistance to private companies to enable them to provide services to informal settlements. Therefore, there is still a need for local authorities to work with private companies to provide services to these areas.

2.3.1.15 Community involvement

Most communities do not give priority to solid waste management or are not involved in the process. Dekker (2000:18) argues that there is no interaction between service providers and beneficiaries, resulting in poor community involvement. Dekker (2000:19) maintains that if communities are not involved and are not educated on all matters related to solid waste management, ineffective solid waste management will still remain.

Local authorities in Kenya neither involve communities in the decision-making process nor do they listen to their concerns and comments. Although they are not involved in the decision-making process, groups of women and men compost organic waste and do recycling. The process helps to improve community environmental conditions and allows the women to obtain an income through the sale of the composting, recycling and collection of waste.

Women are seen as the generators of most household waste; therefore, their commitment to improve earnings and to work would be a major entry to community-based solid waste management. Kim (1998:14) highlights that "the involvement of the community is an effective

way of increasing access of the poor to solid waste management activities". Kim (1998:14) furthermore notes that "the involvement of women is also crucial to the success of community based solid waste management".

According to Devas (2002:4), in any society, elected councils need to be completed by mechanisms of citizen participation, to enable those elected to gauge better what are the needs and priorities of citizens, as well as to create a sense of ownership on the citizens of the services provided by government.

Kenyan local authorities do not give importance to citizen participation due to the Local Government Act (Act 265), which does not make provision for citizen participation. The style of local government is very traditional, as elected councils decide everything behind closed doors.

Devas (2002:4) argues that "many local authorities are very large and therefore remote from citizens. Sadly, some council perceives citizen participation as a threat to their autonomy and position".

Mbande (1998:21) notes that "the ultimate solution to solid waste management is to give responsibility for waste collection to members of the community". The community must be involved, educated, motivated and engaged in the process of solid waste management; they must be able to understand the process of collection and storage, and they must be involved in the process of solid waste management.

It is of extreme importance that communities be educated about all aspects of solid waste management and about the quantities generated. Patrick (2000:19) maintains that communities need to be made aware of the cost of transport and disposal in order to encourage their

participation. Rotich et al. (2005:99) state that "researchers acknowledge that the involvement of the community is central to the success of any system".

2.3.1.16 Solid waste-management framework in Kenya

The Republic of Kenya has no clearly defined legislation on solid waste management. The country uses only the Public Health Act (Cap 242) (Republic of Kenya, 2010) as a principal law. The objective of the Act is to provide sustainable management of the environment. The other legal instrument used is the Establishment of National Environmental Management Authority. The objective of this instrument is to maintain an authority and to coordinate, monitor and supervise all matters related to the environment and solid waste management.

2.3.2 Solid waste management in South Africa

South African residents produce an estimated two kilograms of waste each day. The produced waste consists of glass, cans, paper, clothes, timber, steel, wood, trees, rubber, plastic and other materials (Smith, 2010:1). It is estimated that South Africa generates about 15 million tons of waste per year. The generated waste is growing at almost 7% per annum, which is faster than the population (RSA, DEAT, 1999).

Solid waste management in South Africa has always given local authorities enormous problems. There are few local authorities that can claim to provide adequate services. The Department of Water and Environmental Affairs (RSA, DWEA, 2010), reports that a certain percentage of the urban population of South Africa does not have access to any waste-collection services.

Even in the areas that have access to services, the problems of illegal dumping and littering make it difficult for municipal collection to fulfil its obligation of providing a clean environment for all. Qotole, Xali and Barchiesi (2001:3) claim that residents in most informal settlements and rural areas do not have access to any refuse-collection services. They are forced to dump their waste in open spaces or in unsealed communal skips. In these areas, street cleaning is often nonexistent and municipality workers are unable to cope with the volume of uncollected waste.

Most suburbs, and many township areas, receive a weekly curb-side collection of their refuse. Most residents of townships are obliged to take their garbage to a large communal skip that is placed several hundred metres away from their homes, and which may not be collected very frequently, resulting in overflows of waste that attract dogs, rats and insects and which become a danger to the health of the residents (Donald, 2006:3). The collected waste and other waste material are transported in a secure, closed, covered vehicle with appropriate side and rear gates to prevent its load from dropping and escaping from the vehicle. Some urban waste is disposed of on land while other waste is put into open trenches or sanitary landfill sites (Malhangu, 2009:1).

South Africa has been slow to face up to the gravity of the situation and for what is in store in the future. The authorities, and even more so, the public, have been very slow to address the matter. Figaji (2002:105) claims that there is an urgent need to solve pollution and solid waste-management problems. Rules must be laid for future handling of all solid waste and budgets must be increased.

2.3.2.1 System of governance in South Africa

Decentralisation is a process that consists of allowing local spheres of government to transfer public functions from higher to lower levels. Communities see decentralisation as a way that helps to bring about transformation, changes and improved solid waste management (Jutting, Corsi & Stockmayer, 2009:2). South Africa, with the improvement of laws dealing with solid waste management, has decentralised solid waste-management systems by giving local authorities powers to deal with all matters related to solid waste management. Within the decentralised system, mayors have decisive roles and power to contract companies to work on solid waste, allowing companies to participate by tendering and recruit more public officials.

2.3.2.2 Strategies to combat waste

The Republic of South Africa has adopted strategies to combat waste, namely to recycle, re-use and reduce waste (Schulschunk, 2008:8). Approximately two-thirds of steel cans and glass are recycled, while around half of all paper is reused (Novychenko & Schecchenko, 2011:1). Products are reused several times, for example when shopping, people take their own baskets or bags to the supermarket to avoid using new plastic shopping bags. Goods are sold or donated to churches and people in need, instead of being thrown out. South African residents avoid over-packing products and unnecessarily packaging food. These strategies are vital in providing a chance to individuals and companies operating in solid waste. Schulschunk (2008:8) argues that recycling is the best method when incorporating informal collectors and organised recycling businesses, but to function properly, it requires the use of correct structures, initiatives and recycling systems. Recycling also creates employment opportunities for local citizens.

Rendall Bester of the Solid Waste Network, for example, collects sorted waste from groups to sell to recycling companies. Greener Residence provides plastic bags and does weekly collections of paper, plastic and glass for recycling, charging only R60 per month (Lee, 2009:1).

The Waste Management Department has provided educational programmes for industries and commerce throughout the City of Cape Town area, informing role-players about the principles of integrated waste-management strategies, which are based on the prevention of waste, recycling and the re-use of waste as opposed to landfills.

Furthermore, several places that accept a variety of recyclables can be found. For example, in Cape Town, Integrated Waste Exchange accepts everything from acids to wood and paper. The service is executed by the City of Cape Town and is free of charge for all waste material generators and waste material users (Thompson, 2008:2).

2.3.2.3 Waste-minimisation clubs

Waste-minimisation clubs are groups that work together to reduce waste and save money. Ten to fifteen companies from the same or different sectors compose the groups. The groups can also be formed in-house in larger companies or in the industrial, commercial and public service sectors, where a number of separate departments or business units work together to minimise waste (RSA, DEAT, 2005).

In addition, websites are provided to the public indicating where individuals or companies can take cans, electronic and other waste to be recycled. Lists indicating the collection points and e-waste recyclers in South Africa can be found on websites (Lee, 2009:3).

2.3.2.4 Staff

South Africa has public officials and expertise working in various departments that deal with solid waste management, but mayors, municipal managers, community leaders and public officials are blamed for poor solid waste-management services in the townships. South African communities argue that officers are lazy, overpaid and corrupt (Chandra & Ahmad, 2000:1).

Moreover, local authorities are facing a budgetary constraint, which limits their ability to employ sufficient numbers of public officials to deal with and monitor solid waste management (Mphil & Hoogervorst, 2002:3).

Departments face a shortage of inspectors. For example, there are only eight officers monitoring compliance across the country, resulting in poor enforcement of laws. Strydom (2007:1) maintains that South Africa has waste-management expertise, which allows the country to be part of global efforts, but there is difficulty in monitoring all areas due to various reasons.

2.3.2.5 Dumpsites

It is estimated that approximately 90% of urban waste is dumped on land, either in open spaces or in sanitary landfills. Malhangu (2009:1) says that South Africa has about 1 200 landfill sites, which are controlled by local authorities. Each landfill should have a permit issued by the Department of Water Affairs and Forestry in coordination with the Department of Environmental Affairs and Tourism. Malhangu (2009:2) states that it is becoming more difficult for South Africa to create new landfill sites, and the old ones are becoming full.

Furthermore, communities are fighting against the building of landfills near their places of residence due to bad smells, health risks and harm to the environment. Malhangu (2009:3) maintains that it is imperative that individuals reduce waste from their homes in order to avoid filling the landfills too quickly. Malhangu (2009:1) states that a number of local landfill sites operating in South Africa are able to compete with first-world operations.

2.3.2.6 Household waste

Households generate a variety of biodegradable solid waste, from organic residue to plastic packaging material. It is estimated that in only 10 municipalities, 1.3 million tons of household waste gets collected and taken to the landfill sites (RSA, DWEA, 2007).

Green (2010:1) argues that with waste produced every day, each individual, business and industry needs to be responsible and take action to manage this waste, so as not to harm the environment. South Africans, need to work together to manage household waste in a suitable manner in order to protect the environment. In an effort to limit bringing too much waste home, individuals in South Africa buy only the necessary goods for consumption recycle and create household compost (Global Stewards, 2010:1). Moreover, municipalities use compost at sport facilities and public parks.

The Tygerberg Administration in the Western Cape has two composting plants where municipal solid waste is transformed to compost, thereby saving space at landfills.

2.3.2.7 Industrial waste

Industrial activity, factories, mills and mines produce industrial waste. This type of waste has

existed since the Industrial Revolution. Industrial waste is divided into hazardous and nonhazardous waste. Hazardous waste results from manufacturing or other industrial processes. This type of waste can be gaseous, liquid, solid, hospital materials, paint, pesticides or fluids discarded by commercial establishments or individuals. Ishida (2007:4) confirms that industrial waste produced by industries is regarded as dangerous. As this type of waste is dangerous, its disposal should be heavily regulated.

In South Africa, the mining industry has grown considerably to respond to the demand for platinum, chrome and other products. The mining sector produces a large amount of waste, which contributes to the potential effect of pollution. This waste requires several treatment and disposal strategies (RSA, DEAT, 2010).

According to Tyrer (2007:3), the Institute of Waste Management of Southern Africa (IWMSA) was created to deal with industrial waste. Furthermore, the IWMSA sends public officials who work in solid waste management to seminars, workshops and conferences around Southern Africa and other countries to share information related to waste-management industries. Moreover, South Africa has established industrial waste technologies, which involve composting, incineration and recycling (Orloff & Fall, 2003:5). The treatment of industrial waste takes place in sludge lagoons and other facilities that have the capacity to receive it. An additional company responsible for industrial waste is the South African Nuclear Energy Corporation (NECSA).

Ineffective management of industrial waste has an impact on health care, groundwater and the natural environment. It should be noted that South Africa has improved the construction of landfills to prevent leaching (Finlay, 2005:11). Copans (2007:1) argues that, although landfills,

collection and recycling processes in South Africa have been improved, the waste-management industry is still facing financial difficulties, especially at local government level.

2.3.2.8 Major generators of industrial solid waste in South Africa

Factories and companies are large generators of industrial waste, but the mining sector is seen as the major generator of industrial waste. Industries contribute approximately 20 million tons a year to the waste stream (Malhangu, 2009:1). This type of waste requires effective management.

2.3.2.9 Principal actors in solid waste management in South Africa

There are many actors operating in solid waste management in South Africa. The principal actors are CBOs; NGOs; the formal private (commercial) sector; the informal private sector, including individuals, small entrepreneurs and micro enterprises; municipal governments; mining industries; and companies (Klundertt & Lardionis, 1995:1). NGOs and other CBOs support networks of informal recyclers and their activities. With the support of these organisations, informal collectors are able to expand their activities (Schulschunk, 2008:8).

A number of community centres and organisations promote recycling initiatives through sorting and collection programmes. Organisations also support them financially through active investment, which helps to create jobs and leads to local economic growth. NGOs also help to improve environmental conservation, skills development and the building of social capital (Schulschunk, 2008:8).

2.3.2.10 Ineffective solid waste management

South Africa is unable to collect sufficient refuse-collection charges from households, which proves to be a major obstacle for local authorities. The high-income areas are willing to pay for the improved services, while the low-income areas receive little attention, as most households cannot afford to pay the minimum tariffs charged by local authorities. Low-income areas and local authorities have no clear understanding and prioritisation of refuse collection, which leads to ineffective solid waste management. According to Frost and Sullivan (2010:1), awareness of the need to pay refuse-collection charges is low because residents only prioritise other services such as energy, water, transport and health care.

Although households with low incomes are unable to pay for the service, the market continues to grow because some companies which deal with solid waste management charge low prices. Charging low tariffs encourages low-income households to use waste-management services, thereby helping companies to collect from the non-paying low-income areas (Frost & Sullivan, 2010:1).

2.3.2.11 Causes of ineffective solid waste management in South Africa

In South Africa, the major reason for ineffective solid waste management is attributed to an expansion of urban growth, caused by many people moving from the rural areas to the cities looking for jobs, foreigners emigrating from their countries to South Africa looking for a better life and others running away from war and political instability (Mdlalose 2000:17). Another reason is attributed to the formation of unplanned informal settlements, which have been constructed in a manner that makes it difficult for mobile refuse collectors to drive through. This

has, in turn, resulted in the increase of the amount of waste generated through littering and different waste compositions. The narrow passages between shacks in informal settlements make it difficult for manual collectors to move from shack to shack to collect domestic waste. In addition, some people from the rural areas cannot relate to the concept of solid waste management (Mdlalose, 2000:18).

2.3.2.12 Improvement of solid waste management in South Africa

To improve solid waste management, South Africa has adopted the WasteWise Aware Campaign to promote minimisation and to combat illegal dumping and littering (Schulschhunk, 2008:8). The project focuses on public awareness and school education. In commerce and industry, special events and strategic partnerships have been established. Private companies are contracted to perform diverse activities related to solid waste management. Waste Mart has also been contracted to make weekly collections from formal households, which pay monthly fees for the service.

According to Pistorius (2001:36), new waste-management systems for the cities have been planned to accommodate the needs of South African citizens in terms of solid waste management. Waste-removal services and the creation of landfills have also been put in place.

According to Lombard (2003:37), programmes that specify which type of waste is acceptable to the site and how the site is managed have been adopted. Moreover, in order to ensure a clean environment, it has been proposed that local authorities extend their management structures, not only to consult community members but also to use local residents as contractors who will be accountable to both community and local authorities.

According to Qotole et al. (2001:22), municipalities, in an effort to improve solid waste management, are involved in commercialisation, privatisation, outsourcing and corporatisation as ways of addressing the refuse-collection backlog.

Furthermore, South Africa had contracted Steinhobel Keller Chamtler Inc, which has developed a software program for the modelling and analysis of solid waste-management scenarios in urban areas (Urban management ..., 1998:39). The software is called the Waste Model, and is based on geographical information systems.

2.3.2.13 Privatisation

The private sector is seen as an effective way of providing a solid waste-management service. In South Africa, municipal governments have adhered to commercialisation by privatising solid waste management to address a variety of processes related to solid waste management. Private companies are involved in street sweeping, the recovery of materials, the collection and transportation of waste, the construction and operation of landfills, incinerations and compost plants, and as contractors from the local authorities (Gerlagh & Benkering, 2007:32).

The private companies do not have any direct responsibility for saving the environment and maintaining public health, so their involvement relies on making profits. Gerlaghl and Benkering (2007:34) argue that privatisation functions well in collection and recycling processes.

2.3.2.14 Community involvement

Communities play a crucial role in promoting efficient solid waste management when they are

involved in the decision-making process, but to achieve the goals, it is also important to be involved in all activities related to solid waste (Budde, 2006:5).

Leahy (2009:1) maintains that "community involvement is used to identify its process for engaging in dialogue and collaboration with communities affected by poor solid waste management". Budde (2006:5) states that the purpose of community involvement is to obtain insight into communities' concerns and interests during decision-making processes. The community should be informed about ongoing and planned activities and should be encouraged to participate in all activities related to solid waste management.

In South Africa, communities are involved in decision-making processes, for example, communities have been involved in the discussions at the draft stages of the regulation of solid waste management, before it became law.

Communities are not the only ones involved in the decision-making process. There are also community groups, schools and households that are involved in waste management by sorting out waste into different types of material and recycling unwanted materials. Schulschunk (2008:8) argues that communities and organisations are playing an important role in supporting local waste-management initiatives. This includes access to quality waste transportation of waste to collection points and direct access to buyers and markets for recycling of products such as plastic, paper, bottles, cans, cardboard and glass.

In the informal settlements, there are community-based waste-collection efforts that bring litter or waste to a central collection depot, and these communities are involved in programmes to keep their neighbourhoods clean (Malhangu, 2009:1).

Furthermore, in the Eastern Cape, women recycle plastic bags by crocheting them into hats for sale to tourists (Novychenko & Schecchenko, 2011).

2.3.2.15 Waste Model

The Waste Model software is a map of waste-management areas, allowing engineers to optimise and compare models of transport used for the collection of waste within the areas and to programme the timely purchase of resources. It also predicts the annual costs of transport of waste for each finite element (typically each square kilometre of urban area) for 20 years into the future, thus allowing councils to transport waste and plan waste flow and cash flow well in advance (Urban management ..., 1998:39).

Through the use of the Waste Model, engineers are able to identify actual physical boundaries of the urban areas and assign the portions to specific waste-disposal sites based on cost optimisation (Urban management ..., 1998:39).

Moreover, the Waste Model makes calculations on and optimises compaction equipment for use on waste-disposal sites, and predicts future requirements for a 20-year period. The council/contractor is informed well in advance of site-related costs to ensure effective cash flow (Urban management ..., 1998:39).

The software generates accurate projections of rates that should be charged by councils to the ratepayers in the area, with accurate assignment of transport and disposal costs resulting from each finite element's waste to that element's ratepayers, and allows the consultants to analyse the accuracy of results in the time required (Urban management ..., 1998:39).

2.3.2.16 Converting waste to become a revenue earner

The Stellenbosch Fertiliser Holdings in the Western Cape adopted a process that helps to transform solid waste to products that are then sold. The waste includes bioorganic fertilisers for agriculture, glass powder for industry, plastic manhole covers from plastics, and rubber from used motor tires. The company signed an agreement with local councils to transform all the municipal waste for a period spanning 25 years (Urban management ..., 1998:21).

The transformation of waste became a profitable alternative for the growing worldwide problem of landfills. It helps to eliminate unhygienic landfill sites and contributes to reducing environmental pollution caused by plastic and other materials. Before the process takes place, waste is separated from other materials and then converted into saleable products.

Bezuidenhout (2000:6) argues that South Africa Organics exports 90% of organic waste to first-world countries. Other fertilisers and ground-rehabilitating products are sold directly to local industries. Bezuidenhout (2000) adds that the capital raised by South Africa Organics is used for the establishment of two processing plants located in eastern and western Gauteng in the catchment areas of Krugersdorp and Bronkhorstspruit.

2.3.2.17 Communal containers

In order to manage solid waste in informal areas, containers are placed close to the areas where there is access for residents and vehicles that carry them to the disposal site in an effort to cut costs. The placement of these types of containers has advantages and disadvantages, which are shown in Table 2.2 below.

Table 2.2: Advantages and disadvantages of communal containers (Community Educator for the Great Benoni City Council)

Advantages	**Disadvantages**
• It is regarded as economical due to the drastic cut in the cost of vehicles. • Containers are placed within a walking distance of residents, where there is easy access to transport. This solves the problems relating to the accessibility of informal settlements. • Containers can be moved from one place to another when there is a complaint. • The system has been used extensively. • The service is provided close to households.	• Domestic waste is set alight inside the skips. • Waste is dumped next to the containers and even when the container has been removed, people continue to use the place as a dump area. • There is a lack of ownership. • The vehicles that remove the skips are normally contracted to big companies, thus taking money out of the community. • Companies are only contracted to remove full skips and no service standard is required. • There is no feedback to the consumer. • The quality of the service is generally poor.

The formal areas (suburbs) are kept clean with regular door-to-door refuse collection and workers from municipalities who clean the streets (Qotole et al., 2001:3).

2.3.2.18 Solution to solid waste-management problems

Isolated solutions to solid waste management problems around the world do not exist. Raven Berg and Hassenzahl (2008:555) argue, "there is no single solution to the solid waste management problem". A combination of source reduction, reuse, recycling, compost and burning in sanitary landfills is currently the optimal way to deal with solid waste.

In addition, it is suggested that innovative systems be put in place to ensure effective solid waste management. There is also a need to optimise community involvement in designing and implementing the system and its improvement; to maximise the socio-economic benefits such as skills development, entrepreneur building and job creation; and to ensure that appropriate, cost-effective and affordable systems be adopted to protect the environment (Rotich et al., 2005:93).

Furthermore, it is proposed that local authorities extend their management structures not only to consult community members but also to use local residents and contractors who will be accountable to both community and local authorities.

2.3.2.19 Solid waste-management framework in South Africa

South Africa is enriched with many legal requirements that help to protect the environment and implement solid waste management effectively.

2.3.2.19.1 The Constitution of the Republic of South Africa (Act 108 of 1996)

The Constitution of the Republic of South Africa operates as a framework within which South Africa's environmental legislation must operate (Kidd, 2008:18). The Constitution contains what

could be called an environmental right and ascribes responsibilities to the different spheres of government in the country.

The Constitution Schedule 4 also addresses waste management as an aspect in which the responsibilities are shared among all spheres of government.

The responsibilities of national government are shared between the National Department of Environmental Affairs and Tourism, which ensures that a national waste-management policy is promulgated, and the Department of Water Affairs and Forestry, which has limited responsibilities in this regard (Kidd, 2008:18).

Provincial and local governments have responsibilities to ensure that adequate waste-disposal facilities are available in their areas of jurisdiction.

The Constitution of the Republic of South Africa (RSA, 1996:11) Section 24 stipulates the following in terms of environmental rights:

> Everyone has the right to an environment that is not harmful to their health; to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; to promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Furthermore, the Constitution states, "South African citizens are permitted to have practical legislative and other measures, which prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable economic development" (RSA, 1996:11).

Another important characteristic of the Constitution is the allocation of additional environmental functions to the provinces in schedules 4 and 5.

Sections 155(6) and (7) relate to the allocation of monitoring and supervisory powers to the first two levels of government with respect to environmental management and state that national government must observe the provincial and local governments while the provincial government must pay attention to the local governments.

2.3.2.20 Environmental rights

Kidd (2008:19) highlights two kinds of environmental rights: the right of humans to a safe and healthy environment and the right of the environment itself not to be degraded. Kidd (2008:19) states that environmental rights have been given different emphasis in different constitutions. Some confer an environmental human right, while others require governments to protect natural resources and the environment by declaring formal policies. Such rights impose positive obligations on the state. Another approach is to improve the duty of the country's citizens to protect and conserve the natural environment themselves.

2.3.2.21 The Environmental Conservation Act (No. 73 of 1989)

The Environmental Conservation Act (No. 73 of 1989) (RSA, 1989) provides a definition of waste and its purpose. For example, Section 20 deals with waste management, the operation of disposal sites and the treatment to be given to such waste. Section 24 empowers the Minister to make regulations with regard to waste management. Kidd (2008:8) notes that a set of regulations dealing with the application for a disposal site has been promulgated and that the Minister has

published directions with regard to the control and management of general communal and small waste-disposal sites.

2.3.2.22 The National Environmental Management: Waste Act (No. 59 of 2008)

The National Environmental Management: Waste Act (No. 59 of 2008) (RSA, 2008) has been created with the following purpose to provide institutional arrangements and planning matters related to solid waste management; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide specific waste management measures; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for all matters connected therewith.

2.3.2.23 The National Health Act (No. 63 of 1997)

The National Health Act (No. 63 of 1997) (RSA, 1997) regulates matters related to the disposal of refuse or waste that can cause communicable diseases. In Section 37 (f), the Act highlights how residential, industrial and commercial waste should be treated and disposed of.

2.3.2.24 Institutional framework for waste management

A number of government departments, such as those managing the environment, water affairs, health, trade and industry, tourism, minerals and energy are affected by waste management (Barnard, 1999:302).

The Department of Environmental Affairs and Tourism and other institutions have been created to manage all aspects related to waste management (Barnard, 1999:302). With the creation of

this department and such institutions, it is imperative that waste be reduced. Therefore, the Department of Environmental Affairs and Tourism is authorised in Section 24 of the Environmental Conservation Act "to investigate waste minimisation through classification of different types of waste, reduction of waste and the utilisation of waste" (RSA, 1989). Barnard (1999:302) argues that these objectives can be achieved if an adequate management structure for the final disposal of waste is developed.

2.4 LESSONS LEARNT FROM THE COMPARATIVE STUDY

In doing a comparative study of the two countries, the researcher found that solid waste management in the two countries is similar in some areas but different in others. The two countries are similar in that both generate vast amounts of solid waste. Kenya follows a centralised system of governance, while South Africa has a decentralised system of governance. Solid waste management in Kenya and South Africa is ineffective due to a number of factors.

Both countries adopt the same strategies, namely source reduction, reuse, recycling and composting, but the way in which each country applies the strategies differs. In both countries, people are involved in the collection and recycling processes, through which they earn some money, which allows them to survive.

Kenyan and South African local authorities coordinate and run the activities with a few staff members, who are mostly not well trained and do not have adequate skills. South African communities are involved in the decision-making process of waste management. However, in Kenya, communities are not given such an opportunity; instead, they are merely involved in collection, recycling and composting services.

In the two countries there are formal actors, informal actors and private companies operating in solid waste management, but Kenya faces the most difficulty in managing waste in both informal and formal areas, while South Africa still only faces difficulties in dealing with waste management in informal areas (Manaze, Mulunga, Fawcet, 2001;1).

In terms of dumpsites, Kenya only has one official dumpsite, which operates where many residents live, contributing to environmental degradation and the damaging of citizens' health (Albert, 2012:1).

Kenya has no appropriate landfills, resulting in the dumping of waste at illegal dumpsites and the use of traditional methods (burning and digging holes in the backyard), while South Africa operates with a reasonable number of modern landfills. South African landfills are managed and controlled by local authorities. Moreover, the landfills that are constructed need to have a permit issued by the government of each country. Despite South Africa having quite a number of landfills, some waste is still dumped on the land.

South Africa has adequate legislation that helps to manage solid waste, while Kenya has little legislation. Kenya needs to work hard, involve a considerable number of citizens in the decision-making process and develop more legislation in order to cope with the amount of waste existing in the country.

2.5 KEY LESSONS LEARNT

Based on the research of solid waste, a number of important lessons were learnt from Kenya and South Africa, which should be examined so as to provide guidelines to help tackle solid waste management in Mozambique. Firstly, it was found that there is a need for both the private and

public community to jointly work out solutions to promote sustainable solid waste management. One of the solutions is to emphasise recycling solid waste as an alternative to simply collecting waste and transporting it to dumpsites to be left accumulated. Therefore, the goal is to use solid waste as a resource that will help and protect the environment and communities, rather discarding it as rubbish (garbage). This is imperative, as with the process of recycling many people would be able to use solid waste as a source of revenue, which would help in alleviating their economic situation. As argued by Palczynski and the African Development Bank (Palczynski & African Development Bank, 2002:3), "a high portion of waste could be recycled by the urban poor generating income for themselves".

Secondly, in order to advance with sustainable solid waste management, there is a need for institutions such as legislative bodies as well as management policies that will adequately guide national, local and regional levels (Palczynski & African Development Bank, 2002:3). This would also include putting laws into place that would control, legalise and standardise all waste-management projects. In addition, there is a need for people who would be responsible for the execution of such policies. However, for this process to be effective, the legislation should state clearly how and where solid waste material should be disposed of, which resources should be made available and who will be the stakeholders. It should also indicate penalties that could be applied for those who do not follow guidelines.

Thirdly, education should be given to citizens and communication should be developed to assist society members in knowing how to deal with solid waste. With education, the urban poor would be able to learn ways in which to recycle so as to generate an income for their livelihood.

Furthermore, it was found that the problem of solid waste management has not only affect Mozambique, but also other African countries. However, the most important issue is not the problem but rather the means in which each country tries to find solutions to deal with the problems (Palczynski & African Development Bank, 2002:4).

Thus, because old methods used in Mozambique have not alleviated the issue of solid waste management, new approaches need to be contemplated, and this can be done by considering the waste-management methods that are implemented by Kenya and South Africa. However, such methods would need to be adapted to the Mozambican context.

2.6 CHAPTER SUMMARY

Solid waste management outlines basic strategies, which should be implemented effectively by solid waste-management departments, and there is a need for the establishment of strong links with other relevant institutions and for the involvement of the community. The legal framework requires implementation and enforcement. Solid waste-management staffs need to be trained on all matters related to solid waste management to be able to implement the outlined strategies and to enforce policies.

CHAPTER 3

LEGAL FRAMEWORK OF THE REPUBLIC OF MOZAMBIQUE PERTAINING TO SOLID WASTE MANAGEMENT

3.1 INTRODUCTION

The purpose of the chapter is to analyse the legal framework of the Republic of Mozambique pertaining to solid waste management.

3.2. DEFINITION OF POLICIES

Policies are guiding principles designed by government in order to allocate resources that satisfy the needs of a society. Cloete, Wissink and Coning (2006:14) state that governments employ policies to modify, normalise and improve the conditions of humanity.

To achieve this, government needs to develop appropriate techniques. Cloete et al. (2006:75) maintain that an effective technique to adjust policies involves collecting and using adequate and sufficient information that focuses on the public's needs and their aspirations.

3.3 LEGAL FRAMEWORK OF THE REPUBLIC OF MOZAMBIQUE

To modernise and adapt the laws of integrated solid waste management, as well as the operating framework for the participation of other legal persons, in particular the private sector, the Municipal Assembly, acting on a proposal from the Municipal Council, adopted Resolution 15/AM/2004, dated September, amending the first policy in order to accommodate the regulation

of urban solid waste management and environment management and to introduce the Principle of Polluter Pays (Municipality of Maputo City, 2008).

3.3.1 The Constitution of the Republic of Mozambique (2004)

The Constitution is the highest sovereign law of the Republic of Mozambique. In the Constitution of the Republic of Mozambique (Republic of Mozambique, 2004c), Chapter V of articles 90, 98 and 102 addresses matters related to the environment and quality of life (Khoza & Tarr, 2007:195). Paragraph 1 of Article 117 of the Constitution further stipulates that "the State is responsible for promoting initiatives that ensure ecological balance and the conservation of the environment for improving the quality of life of the citizens and the duty to defend this right".

Paragraph 2 of Article 117 states the following:

> The state shall adopt policies that: a) prevent and control pollution and erosion; b) integrate environment objectives in sector policies; c) promote the integration of environmental values in educational policies and programmes; and c) ensure the rational utilisation of natural resources within their capacity to generate income and protect the environment.

Section 2 stipulates that "the state and local authorities, with the collaboration of environmentalists, should adopt policies to defend the environment and ensure the rational use of all natural resources".

Moreover, the Constitution extends this when it gives rights to other citizens to participate on the activities of solid waste management. These rights are the right to a) freedom of association (Article 52); b) access to courts (Article 62); and c) go to court (Article 70).

Article 30 of the Constitution (Republic of Mozambique, 2004c) states that "in order to guarantee the necessary participation of local communities and the adequate use of the human resources and knowledge of these local communities, the government, in co-ordination with local authorities, shall promote the establishment of community supervisors".

The realisation of these rights requires the correct management of the environment and the elements of which it is made up, as well as the creation of conditions that are favourable to the health and wellbeing of people, to the socio-economic and cultural development of communities and to the preservation of the natural resources that sustain them.

These innovations led to a perception by citizens that actions could be taken to prevent the destruction of the environment and, consequently, to promote a higher quality of life for all.

Thus it can be concluded that the Constitution of the Republic of Mozambique ensures a fundamental right, which is directly related to the right to life of present and future generations.

3.3.2 The Ministry for the Coordination of Environmental Affairs

For the conservation and preservation of natural resources, the government of Mozambique created the Ministry for the Coordination of Environmental Affairs, whose objective it is to implement the National Environmental Management Plan and associated environmental policies and legislation, as well as to establish coordination with other ministries on environmental matters to integrate environmental aspects into their projects, programmes and policies (Republic of Mozambique, 2004a).

The Ministry for the Coordination of Environmental Affairs is responsible for the coordination

of environmental action at a central level, and has the right to produce national regulations for some types of waste, namely hospital and hazardous waste. The rights are stipulated in Decree 8/2003 of 18 February (Republic of Mozambique, 2003) (adopting the regulation on the management of biomedical waste). In this context, local authorities establish coordination with the Ministry for the Coordination of Environmental Affairs, in particular issues related to the management of biometric waste. This requires coordination between the Ministry for the Coordination of Environmental Affairs, municipal councils and other government institutions.

3.3.3 The National Environmental Law (Law No. 20 of 2004)

The National Environmental Law (No. 20 of 2004) (Republic of Mozambique, 2004e) is the principal law that sets environmental regulations regarding the preservation of the environment and it is an essential legal requirement for the performance of specific regulations. It establishes fundamental beacons for the sustainable management of the environment and its components.

Furthermore, the National Environmental Law constitutes a legal recognition of the interdependence between sustainable development and the environment. Chapter 3 of the National Environmental Law provides a close coordination between the Ministry for the Coordination of Environmental Affairs and local authorities.

Article 2 of National Environmental Law defines the legal basis for judicious utilisation and management of the environment and its components. The ambit of the National Environmental Law comprises all activities, public and private, which can directly or indirectly influence the environment.

Article 4 of the National Environmental Law (Republic of Mozambique, 2004e) establishes the basic principles for environmental management, namely:

a. rational utilisation and management of resources with a view to promoting improved quality of life of citizens and maintenance of biodiversity and ecosystems; and
b. recognition of traditions and local knowledge that contribute to the conservation and preservation of natural resources and the environment.

Article 7 (Republic of Mozambique, 2004e) stipulates that "municipal councils should be trained around solid waste management, household and hospital waste". This means that the municipal councils are responsible for the improvement of solid waste-management systems and the protection of the environment.

Moreover, the resolution foresees the need for the introduction of systems for the treatment and recycling of solid waste, and allows for the creation of conditions for the management of the legal dumpsite.

The National Environmental Law goes even further when it advocates the introduction of mechanisms for separation of household waste, hospital waste and industrial waste.

Moreover, Article 8 of the National Environmental Law (Republic of Mozambique, 2004e:33) stipulates as follows to ensure that the National Programme for Environmental Management is followed:

It is the duty of the government to create appropriate mechanisms through which the different sectors of civil society, local communities and particular associations can

participate in the preparation of policies and legislations related to the management of the Nation's natural resources and in the development of activities.

3.3.4 Environmental Quality Standards Act (No. 18 of 2004)

The objective of the Environmental Quality Standards Act (No. 18 of 2004) (Republic of Mozambique, 2004d) is to establish the principles for effective management of ecological waste matters and to monitor and preserve permissible levels of absorption of pollutants in the atmosphere. The Act has been established in order to provide national norms and values for the management of waste.

According to Article 26, "the provisions of the regulation are applicable to all public and private activities that direct or indirectly may affect the environment". The Act further stipulates that a person found guilty of violating the norms will be imposed with the payment of a fine.

It should be noted that even a comprehensive and modern environmental law is not enough for the effective protection of the environment if there is contradiction between the law and practice, as rules created only remain on the paper.

3.3.5 Local Government Act (No. 2 of 1997)

The purpose of the Local Government Act (No. 2 of 1997) (Republic of Mozambique, 1997) is to allow the establishment of municipalities in accordance with the necessities of the country, appropriate divisions of functions and powers, and internal systems and structures that are regulated.

Article 6, Paragraph 1, states that local authorities must respect common, specific interests and satisfy the legally established needs of the population.

Moreover, the Act gives power to local authorities to raise their own revenues and conduct their finances in an accountable and transparent way. Cuenereia (2001:6) states that the law obliges local authorities to prepare an adequate financial plan, which is in accordance with municipal objectives and valid for a period of five years.

Article 6 of the Local Government Act gives the national councils power and authority for sustainable development of the environment, while Article 7 stipulates that "local authorities are responsible for the establishment of services and should assume responsibilities for the implementation of the law".

In addition, Article 8 stipulates that "services must guarantee coordination and implementation of environmental activities at this level in order to acquire the benefit of local initiatives and knowledge".

Article 9 stipulates that it is not allowed in the national territory, the production, and storage of waste in the soil, the release into the atmosphere of any toxic substances and pollution as well as practical activities that accelerate erosion, desertification and other forms of environmental degradation.

Article 20 of the Local Government Act, states that the correct management of solid waste requires community involvement, through government, in coordination with social communication entities, which should establish mechanisms and programmes for formal and informal environmental education.

Article 46 defines competence of the Municipal Assembly, as part of its mission to protect the environment, as the approval process for the removal, treatment and disposal of solid waste, including hospital and toxic waste.

At the central level, the decrees for solid waste management discussed in the following sections were enacted.

3.3.6 Decree 13/2006

Decree 13/2006 (Republic of Mozambique, 2006a) regulates solid waste management. The decree establishes rules related to production, the deposit on the ground water or air of any toxic substances as well as pollution in order to minimise the negative impacts on the health of city dwellers and the environment.

3.3.7 Decree 8/2003

Decree 8/2003 (Republic of Mozambique, 2003) regulates biomedical waste management. This is a regulation laying down rules for the management of biomedical waste in order to safeguard the health and safety of the country as well as health facilities, workers and auxiliaries of the general public and to minimise the impact of waste on the environment.

3.3.8 Decree 153/2002

Decree 153/2002 (Republic of Mozambique, 2002) is known as the regulation on pesticides. It has been created to be used for the recording, import, transport, disinfection, production and application of agricultural pesticide used in livestock and public health.

3.3.9 Resolution 86/AM/2008

The legislative framework on solid waste management is the result of successive interventions over time and was not harmonic, insufficient and inadequate in terms of national legislation in force in the country (Municipal Council of Maputo City, 2008:5).

Thus, it became necessary to undertake a substantial review of municipal legislation on cleaning the city in order to adapt to the legislative framework and laws of the country and to meet the specific needs of a city which is constantly growing.

Therefore, the Municipal Assembly, under the powers conferred by Act 2/97, (Republic of Mozambique, 1997) Article 45 no. 3, Section A and by Act 13/06, (Republic of Mozambique, 1997) Article 1 approved the norms of Cleanliness of Urban Solid Waste in Maputo City, and made an amendment to the cleaning fees (Municipal Council of Maputo City, 2008).

The Directorate Plan for Solid Waste Management (Municipality of Maputo City, 2008:26) states that the aim of the Posture of Cleanliness of Urban Solid Waste in Maputo City is to establish –

a) an improvement of the social conditions of residents, following a major and progressive involvement of communities to make the city clean through facilitation, involvement and local development;
b) the improvement of environmental conditions, hygiene, public health and aesthetics, with special emphasis on developing the system of solid waste management and reducing the environmental impact caused by solid waste through reuse and recycling; and

c) an increase in participation and progress of the private sector in solid waste management, not only regarding the collection, transport and deposition of solid waste but also essential activities such as recycling and reuse.

Article 2 of Act 86/08 (Republic of Mozambique, 2008) stipulates that the Municipal Council of Maputo City must submit to the Municipal Assembly within 90 days the following specific regulations:

a) Regulation on the Components of Cleanliness of Urban Solid Waste Management of Maputo City;

b) Regulation on Private Sector Participation in Cleanliness of Maputo City; and

c) Regulation on the Supervision of the Activities of Cleanliness of Maputo City

Article 4 describes the fundamental principles of the cleaning system of the city of Maputo, namely –

a) the Principle of Broad Participation, which states that the cleaning system is not the exclusive task of the Municipal Council of Maputo City only, but should also be the responsibility of the private sector, society in general and every citizen in particular;

b) the Principle of Polluter Pays, which states that the polluter must restore the quality of the environment damaged and/or pay the costs for the prevention and elimination of the pollution itself caused by the polluters;

c) the Principle of the 3 Rs, where the cleaning system of Maputo focuses on reducing, reusing and recycling solid waste, and to this end, the necessary administrative, fiscal and legal issues that are necessary and appropriate should be taken up;

d) the Principle of Producer Responsibility, which states that public or private producers of solid waste are responsible for its collection, transportation, treatment and final disposal; and

e) the Principle of Rectification at Source, which states that municipal solid waste should be disposed of as close as possible to where it is produced to avoid the economic, social and environmental impacts inherent in their transportation (Municipality of Maputo City, 2008).

Article 5, Section 1 stipulates that it is the responsibility of the Municipal Council of Maputo City, in combination and coordination with other institutions, clean municipal waste generated in its area of jurisdiction, including the sweeping, placement, collection, transportation, storage, transfer, treatment, disposal and final destination thereof.

Chapter 3, Article 8 stipulates that the Municipal Council of Maputo City, as well as all private entities that develop activities related to solid waste management, should develop a plan for managing the waste before the start of its activities in accordance with the Waste Management Regulations (Decree no. 13/AM/2006) (Republic of Mozambique, 2006a). The plan should be submitted to the Ministry for the Coordination of Environmental Affairs for approval, within 45 working days, and plans of municipal solid waste are valid for a period of five years, counted from the date of its adoption.

Article 9 stipulates that all installations for the disposal, treatment, recovery or disposal of solid waste are subject to environmental permits, in accordance with the Regulation on the Procedure for Environmental Impact Assessment, adopted by Decree no. 45/2004 (Republic of Mozambique, 2004b).

Article 10 stipulates that all entities producing or handling solid waste must minimise waste production of any category, must ensure the segregation of different categories of solid waste and their processing before their replacement, and must ensure that waste disposal in on- and off-site production has little negative impact on the environment or on health and public safety.

These legal instruments constitute the environmental legislation in force and reflect a fairly generic legal framework, of which the key characteristics are the following:

- the definition of responsibilities for the management of different types of solid waste;
- a definition of conditions, activities and implementation of concrete measures and goals of municipal solid waste management; and
- a definition of duties and rights of the municipality regarding solid waste systems, relating to, for example, who is responsible for cleaning the city and which sources of income and finances are needed by the municipality to conduct effective solid waste management.

3.3.9.1 Proof of service

Based on Resolution 15/AM/2004, Article 45, Paragraph 3, the Local Government Act, and Resolution 16/AM/04 was approved, which introduces an amendment to the attitude about the cleaning of Maputo City to define a modern and innovative instrument and proof of service (Municipality of Maputo City, 2008).

Proof of service is an obligation required for large producers of municipal solid waste as a means of asserting the Principle of Polluter Pays, enshrined in the National Environmental Law 20/2004.

Furthermore, Resolution 89/AM/2008, regulating solid waste management, was put in place with the aim to lay foundations and general standards to govern the cleaning system of Maputo.

3.3.10 Directorate Plan for Solid Waste Management in Maputo City

The Directorate Plan for Solid Waste Management in Maputo City is a basic strategic plan for all activities related to solid waste management and it is valid for a period of twenty years. The plan has been approved through Resolution 85/AM/2008 (Republic of Mozambique, 2008). The plan was designed to ensure effective and sustainable solid waste management and to provide institutional arrangements and planning regarding solid waste-management matters (Municipality of Maputo City, 2008).

3.3.11 Environmental Inspection Act (No. 11 of 2006)

The Environmental Inspection Act (No. 11 of 2006) (Republic of Mozambique, 2006b) was approved in order to regulate solid waste-management inspection. The Act gives power to inspectors to take the responsibility of carrying out solid waste-management inspections, command supervisions and monitor and determine the extent to which activities related to solid waste management are carried out, taking into account the approved legislations. Inspectors are obliged by the legislation to inspect solid waste-management activities and to determine whether the activities are harmful to the environment. The Act also gives power to the inspectors to do compliance checks and to oversee the enforcement of the law pertaining to solid waste-management activities.

3.3.12 Resolution 18 (Republic of Mozambique, 1996)

Mozambique not only uses national environmental laws, but has also adhered to international regulations. Mozambique has ratified the Bamako Convention on the Ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa as well as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal through the above resolution.

The Bamako and Basel conventions have been created with the purpose of providing clear guidance in the control and transboundary movement of non-hazardous and hazardous waste between countries.

3.3.13 Memorandum of Understanding on Cooperation in Environmental Management

A Memorandum of Understanding on Cooperation in Environmental Management was signed by the seven governments, namely: Mozambique, Burkina Faso, Malawi, São Tomé e Príncipe, Kenya, Tanzania and Uganda on 22 October 1998. The main characteristic of the document was a commitment to develop a protocol on environment management (UNEP, 1999).

3.3.14 Project on Environmental Law and Institutions in Africa

The Mozambican government and other African countries founded a project in conjunction with the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP) to manage waste effectively. The objective of the project is to work with some African countries towards the development of environmental laws and institutions in

Africa, and to enhance the capacity of the countries to develop, implement and enforce laws relating to environment and solid waste management (UNEP, 1999).

The project started in 1995 involving seven countries, namely: Mozambique, Burkina Faso, Malawi, São Tomé e Prínciple, Kenya, Tanzania and Uganda (UNEP, 1999).

The seven countries developed and harmonised a variety of policies related to solid waste management and the environment. The process of drawing up these laws was undertaken with the intention of making amendments to the internal legislative and administrative framework of each country. The countries met and agreed on legal principles, definitions and substantive legal provisions to govern matters of the environment and solid waste management. The laws were designed to equip the countries to deal with matters related to environmental policies (UNEP, 1999).

3.3.15 Views of various authors on solid waste management and environmental policies

Solid waste-management and environmental policies are desired in order to handle growing amounts of waste that are produced everywhere. Albany (2003:9) argues that such policies are developed in order to coordinate all environmental activities related to pollution control and waste management.

Solid waste-management and national environmental laws are vital machinery for the local authorities to manage waste and to protect the environment. Medina (2010:7) adds, "solid waste management policies in any country are the foundation of local authorities and central government so that the citizen's health and the environment are protected".

Medina (2010:7) further argues that existing solid waste-management and environmental policies should be endorsed, implemented and enforced to help governmental institutions reduce the waste generated by communities, industries and other producers.

Koen (2005:11) argues that solid waste-management policies are made to help reduce the amount of waste generated, to reuse material or recycle material that cannot be reused, to recover solid waste that cannot be economically and technically recycled or reused and to dispose of solid waste that is not being reused or recycled. Moreover, the author supports the view that policies are designed to guide solid waste-management programmes and decisions on how solid waste should be managed.

Zurbrugg (2003:4) argues that policies provide an ordered listing of preferred solid waste-management methodologies for the management of any type of waste in a manner that helps to reduce dependency on land burial of waste. The author adds that when solid waste-management policies are developed, there is a need to consider economic and technical feasibilities and to ensure that such considerations will guide the solid waste-management programmes and decisions at any level of national and local government.

Moreover, officials must be able to interpret, apply and enforce the approved policies. Zurbrugg (2003:4) recommends that every local authority plan, discuss, coordinate and consult the communities on proposed policies before their implementation and ensure that the policies satisfy the needs of the communities. In addition, the approved policies must be evaluated periodically to check whether they are working.

Koen (2005:2) maintains that to develop solid waste-management framework implementation

and enforcement of the laws, comprehensive data on anticipated waste situations, knowledge and capacity are required.

The formulation and implementation of policy helps to reduce waste littering and pollution. On the other hand, it also resolves socio-economic problems, protects informal waste operators, reduces poverty, creates more jobs and preserves culture.

Furthermore, the environmental and solid waste-management policies formulated by the local authorities and other institutions describe the responsibilities that the local authorities and departments have in terms of protecting the environment and solid waste management as well as the procedures and programmes that should be followed to manage the amounts of waste.

Paunde (2010:11) states that the Mozambican central government, in coordination with local authorities, need to have clearly defined guidelines in order to manage waste and protect the environment in an environmentally sound manner, as there are vital instruments that contribute to effective solid waste management.

As can be seen, various national and international policy initiatives dealing with environmental protection and solid waste management exist in Mozambique. The policy initiatives are national, provincial and international and are contained in several official documents, but what is required is to review and determine whether or not the existing policies are adequate for the proposed objectives and whether they are able to achieve the desired effects. As stated in the Report on the Development and Harmonisation of Environmental Laws, "there is also a need to determine the gaps that may exist within the current legal framework so as to provide an appropriate basis for recommended policy reform" (UNEP, 1999:11).

3.4 CHAPTER SUMMARY

Since 1995, the government of the Republic of Mozambique has created adequate national and local policies for the management, transportation, storage and disposal of solid waste.

Legal frameworks constitute a fundamental instrument to cope with the amount of waste generated every day. These legal frameworks include the Constitution of the Republic of Mozambique of 2004, the Environmental Policy, decrees and regulations that regulate all matters related to environmental protection and solid waste management.

The country not only follows national laws but also adheres to international laws that regulate environmental protection and solid waste management.

CHAPTER 4

AN INVESTIGATION OF SOLID WASTE MANAGEMENT IN THE MUNICIPALITY OF MAPUTO CITY

4.1 INTRODUCTION

The purpose of this chapter is to investigate solid waste management in the Municipality of Maputo City.

4.2 ISSUES OF STATE CAPACITIES AND ORGANISATION

4.2.1 Relationship of the formal to the informal economy

The formal economy within Maputo City is one that has efficient waste-collection methods. The formal economy is comprised of industrial industry, tourism and commercial activities. In terms of the industrial sector, items such as fish, animal and agricultural products are processed (Ferrão, 2006:12). Although large quantities of waste are produced in this sector, they are tackled in a more positive manner. This is owing to the more controlled nature and organised removal of solid waste activities (Ferrão, 2006:12). However, it needs to be noted that the industrial sector has a higher level of solid waste than the commercial sector. The tourism industry deals with waste in an efficient manner. Tourist areas include Sommershield, Polana A and B and Museu, where many tourists spend their time when staying in Maputo waste is get collected regularly (Ferrão, 2006:13). These areas accommodate institutions such as financial institutions, NGOs, offices, diplomatic and institutions of state administration (Ferrão, 2006:12–13). However, "the collection of waste is not only conducted by the Municipality of Maputo but also by Environmental Work Group" (Karani, 2006:6).

Karani (2006:8) states, "during the year 2002 in Maputo about 68.1% people were involved in the informal economy than in the formal economy". According to Hanlon (2008:19), "due to the lack of space available in the formal economy many economically active people turn to working in the informal economy, and the remaining people stay unemployed". The informal sector includes selling agricultural goods or other products in unofficial markets, on streets or at home.

Areas that are involved in the informal economy management of solid waste are lower than those areas in the formal economy (Ferrão, 2006:12). This shows that greater emphasis on solid waste collection is placed in areas that conduct business, that accommodate foreigners and that show that development will take place. Consequently, areas that are engaged in the informal economy are not prioritised, which leads to the poor collection and management of waste.

4.2.2 Solid waste: Institutional structure and capabilities

In terms of institutional structure and capabilities, Maputo City has a weak solid waste-removal system. This is because a small number of buildings have waste-collection channels that are in a good state and correctly preserved (Ferrão, 2006:14). Furthermore, "there is inadequate space for the storage of waste that is collected from buildings where many people live (Ismael, 2010:1). Consequently, the issue of solid waste management in Maputo City is a very complex one. Hence, when developing a waste-collection system, priority should be given to areas that do not have adequate waste-collection means. The existing system of placing large waste containers in the streets and insisting on residents carrying waste to these containers should be resolved.

The municipality has weak capabilities to execute the management and collection of solid waste. This is because all households pay an amount of 30 MT monthly in order for the municipality to

collect the waste that is produced by these households. However, the problem is that the amount designated to collect the waste is insufficient. It is insufficient to cover costs relating to wages for the workers who collect the waste and for those who perform related administrative functions; costs relating to fuel, maintenance and repair of vehicles that collect the waste; and costs relating to frequent waste collection and disposal. Allen and Jossias (2011:7) argue that "solid waste management consumes more of the total municipal funding for services and within this the salaries and wages component is usually over 75% of the annual expenditure on Municipal Solid Waste Management". Therefore, the money and the resources for capital investment are insufficient (Costa & Karani, 2007:36). "An immense impediment to financial planning is that most municipalities do not know how much they will waste on the various areas of solid waste; this is partly due to the inadequately organised financial reporting schemes" (Kruks, 2006:3).

In addition, there is also the problem of the existing waste-collection methods. The problem lies in the fact that Maputo City adopted the colonial system of collecting waste. This system is inappropriate for the present day because during colonial period there were few people living in Maputo City.

4.2.3 Cultural questions associated with solid waste

Maputo City is composed of variety of cultures, such as Europeans, Africans, Asians as well as Mozambicans who come from the north and the south of the country. Such diversity means that each culture follows different norms, values and beliefs of collecting waste. In this regard, Karani (2006:34) states, "For the effective implementation of future solid waste management systems, cultural standards need to be considered. Furthermore, future projects have to

encourage sustainable development and environmentally viable methods of collecting and disposing waste."

4.2.4 Willingness to engage actively in the informal actors

According to Ferrão (2006:15), "many of the informal areas have poor solid waste removal strategies and poor initiatives because these areas are mostly uncontrolled and the waste that is produced exacerbates the waste collection system in the city". Because most areas around Maputo City are largely informal, the government and the municipality do not have much incentive or the will to try to come up with solutions to the solid waste issue. Consequently, they also lack the motivation to attempt to engage with informal actors. However, this then turns problematic because the informal actors have the knowledge and the awareness of what is required to come up with effective solid waste-management systems, and the government does not make use of resources to try to come up with solutions. Therefore, the government has appropriate resources in terms of human knowledge, but lacks appropriate financing in order to execute activities of waste collection by using the knowledge that is available.

Furthermore, because informal actors operate in densely populated areas that have low economic development, the willingness to actively engage with these actors is low. This is because the government would need to spend more time and money on these areas because they are so difficult to reach.

4.2.5 Attitudes to the state at local level

After Mozambique had become independent, it was a one political party state, which was very

strongly controlling all activities at central and local level. According to Kruks (2006:21), city planning, including the provision of urban services, was controlled by central government". Despite Liberation Front of Mozambique "Frelimo" being in possession of all power, the Frelimo has failed to regulate solid waste management, the city and markets and to deliver services.

Responding to this failure, the government developed an informal economy that is currently stronger than the formal economy. The informal economy allows participation of many urban citizens that through informal recycling earn an income to survive and escape poverty. Kruks (2006:21) argues that "the state presence has become informalised too; many public officials are involved in corruption to be able to survive due to have low incomes".

4.3 SOLID WASTE MANAGEMENT IN THE MUNICIPALITY OF MAPUTO CITY

The Republic of Mozambique is a developing country with citizens generating large amounts of waste. Tons of waste comes from wrappings, bottles, cans, grass clippings, phone books, boxes, furniture, clothing, tires, appliances, paper, steel, plastic, paperboard, wood, tree limbs, aluminium and other metals (Linckia, 2001:3).

Table 4.1 shows the percentage of waste generated in different areas of Maputo City.

Table 4.1: Percentage of waste generated in different areas of Maputo City (Municipality of Maputo City, 2008).

	Cement City	Suburban zones with higher-density population	Suburban zones with lower-density population
Components	%	%	%
Paper	12	5	2
Rubber	2	4	2
Metal	2	2	1
Organic waste	69	68	29
Plastic	10	9	4
Glass	3	3	1
Other material	2	9	4

According to the Local Government Act (No. 2 of 1997), the responsibility for all activities related to urban solid waste management is in hands of the Municipal Council. The Department of Municipal Services, Health and Salubriousness is responsible for the cleanliness of the city, and the Health Services and Salubriousness Council assumes the responsibility of supervising all activities (Municipality of Maputo City, 2008:29).

The Municipal Council and the Department of Municipal Services, Health and Salubriousness are also responsible for the following activities:

- collection and transportation of solid waste in low income areas;
- sweeping of roads and sidewalks and removal of solid waste;
- management of municipal trash;

- management of municipal cemeteries; and
- management of activities in the area of prevention and promotion of health.

In Maxaquene and Urbanisation[2] there are small enterprises and local associations participating in the collection process of solid waste.

The Directorate Plan for Solid Waste Management of Maputo City 2008 states that the Municipal Council of Maputo City is responsible for the transportation of all waste generated in the city. Although facing difficulties in transporting waste to the dumpsite, the Department of Municipal Services, Health and Salubriousness makes an effort to maintain the fleet of vehicles. They possess an auto park for trucks to collect solid waste and they operate a large installation camp, located in Xipamanine District. In addition to the auto park for cars, they employ a large number of workers who work on the management of solid waste.

4.3.1 Classification of solid waste in Maputo

Solid waste can only be managed effectively if it is classified properly. Rodrigo (2004:20) states that solid waste in Maputo is considered as a potential risk of contamination of the environment and human beings. This waste is divided into three classes.

Class I hazardous waste is waste that possesses peculiar characteristics, such as flammability, corrosivity and reactivity. Hazardous waste is seen as dangerous due to its adverse effects on the environment and to public health when not properly disposed of. Examples include lamps, needles, batteries and syringes (Rodrigo, 2004:20).

[2] Maxaquene and Urbanisation are areas where middle and low households live.

Class II non-inert waste is waste that exhibits characteristics of combustibility and solubility. It can cause risks to human health or damage the environment. Examples include food scraps produced in the kitchen (Rodrigo, 2004:20).

Class III inert waste poses health risks to human beings but does not damage the environment. Examples include glass and mirrors (Rodrigo, 2004:20).

4.3.2 Classification of solid waste in terms of its source

Rodrigo (2004:21) states that solid waste as a source or nature may be classified into the following categories:

a) Household or residential waste, which is produced in households' daily activities at home and in apartments and other residential buildings. Domestic waste consists of food scraps, newspapers, magazines, old clothes, shoes and books. Other waste produced at home, which can possess toxic includes bulbs, batteries, varnish, ink and paint or sharps (needles, blades, scissors), so it is important to be careful in their handling.

b) Commercial waste is produced in commercial establishments and services. These services can be banks, institutions, bars, restaurants and others. Waste in these places consists mostly of paper, plastic and packaging used in personal hygiene and cleanliness in the shops.

c) Public residues are waste arising from the roads, streets, public squares and beaches. Examples include leaves and branches.

d) Special waste is waste that requires special care in handling, packaging and transport and at the final destination. The originators of this class of waste are mostly industries, healthcare facilities, construction ports, airports (Rodrigo, 2004:21).

e) Industrial waste is generated by industrial activities such as textile, chemical and metallurgical activities. This type of waste has different characteristics depending on the type of product used as raw material. This group includes residues such as oils, acids, ash and rubber. Due to the special characteristics of this waste, it cannot be deposed of in the same site as household waste (Rodrigo, 2004:21).

4.3.3 Segregation of waste by the Municipality of Maputo City

The segregation of waste requires the adoption of an appropriate criterion, allows for differential treatment, helps to rationalise resources and facilitates the recycling of materials. Segregation is also important because it prevents the mixing of incompatible waste and reduces the volume of hazardous waste. Segregation is an important process, but it requires that waste be separated in a proper place and the avoidance of mixing liquid waste with solid waste (Municipality of Maputo City, 2008).

The Municipality of Maputo City does not apply this process due to the lack of appropriate places to separate waste.

4.3.4 Waste packaging

Waste packaging refers to the way solid waste is presented at the time of collection. The packaging process begins at the site where waste is produced (private homes, hospitals, shops,

industries and institutions). In order to prevent accidents, the proliferation of vectors and the transmission of diseases and to minimise the visual impact and facilitate the implementation of solid waste collection, the Municipality, with the few resources that it possesses, has created proper conditions for packaging and transport of waste to the dumpsite. Although the Municipality had created conditions for packaging waste produced in Maputo City, the households have no education in packaging waste; hence there is a need to teach and enlighten the community on how to package waste appropriately when it is brought to the containers (Municipality of Maputo City, 2008).

4.3.5 Principal aspects when packaging waste

When packaging solid waste, Rodrigo (2004:23) advises that the following important aspects need to be considered:

a) adequate methods and standards must be followed;
b) the ability to contain the waste from one collection;
c) facilitation of the collection process, making it effective and enabling safe handling by the collection team; and
d) it should not look ugly, disgusting or unpleasant.

After preparation, the solid waste should be transported in plastic containers or other suitable containers to the place of removal. The type of container depends on factors such as the characteristics of the solid waste, its production, the frequency of collection, the type of construction and the price of containers.

4.3.6 Storage of solid waste

Storage refers to the place where the waste is temporarily deposited before being brought to the final treatment. In choosing the area where waste will be deposited, one must take into account the following aspects: the site should be easily accessible for transport equipment; the site should be slightly away from the administrative areas; it must be controlled in terms of wind direction and avoiding odour problems; the waste must be properly identified; and the facility must have safety equipment and personal protection compatible with the regulations regarding waste and possible emergencies.

4.3.7 Types of containers used in Maputo City

The Municipality of Maputo uses 354 containers with the following dimensions: 273 containers of 1.1 m^3 for compactor trucks, 76 containers of 6 m^3 and five containers of 10 m^3 for use within suburbs, markets and Cement City (Municipality of Maputo City, 2008). These types of containers are not appropriate, as they occupy too large spaces.

Maintenance and repair of these containers are done inside the installations of the Department of Municipal Services, Health and Salubriousness. Available containers distributed in 2005 are damaged, causing citizens to deposit their waste along the streets while others apply traditional methods (Municipality of Maputo City, 2008).

The actual system for collection and transportation of waste covers only 50% (Cement City) and approximately 25% in other zones (Municipality of Maputo City, 2008).

4.3.8 System of collection in different residential zones

In Maputo City, the system of collection of solid waste varies according to residential zones and types of waste. There are two types of residential zones with different population densities:

a) Cement City

Cement City is divided into two parts, namely a zone with tall buildings and many business with a high population density, and individual houses with a lower population density (Municipality of Maputo City, 2008).

The Department of Municipal Services, Health and Salubriousness concentrates efforts on the removal of solid waste in these two areas. The areas have the following characteristics:

1. High-density area. In this area, the Department of Municipal Services, Health and Salubriousness has placed large containers to deposit waste produced by citizens living in the area. The scheme entails a daily collection service. The collection of waste in the area is done at 08:00 and 20:00. As the area is also the commercial centre of the city, the production of waste is extremely high and therefore the Municipality concentrates its efforts on removing waste daily (Municipality of Maputo City, 2008).

2. Zone with detached houses

In this area, residents deposit their waste in different plastic bags, which are collected daily, but in some areas individuals who work for persons contracted by the Municipality of Maputo City collect waste twice a week. The individuals use wheelbarrows to transport waste to a large container, usually on Thursdays and Fridays. The Municipality

of Maputo transports this waste by trucks and open box compactors to the legal dumpsite (Municipality of Maputo City, 2008).

b) Inner Suburban Bairros

Inner Suburban Bairros has fewer means at their disposal for solid waste collection. Along the boulevards and main streets, the Department of Municipal Services, Health and Salubriousness distributed five containers of 10 m^3 each (type: roll on/roll off) and approximately 25 containers of 6 m^3 each (type: skip). Since February 2007, a private company is strengthening the capacity to collect waste in these areas. The Department of Municipal Services, Health and Salubriousness has also provided 55 containers of 6 m^3 and 17 large containers of 10 to 20 m^3, significantly increasing the collection capacity. With the introduction of new cleaning fees in May 2007, these containers were distributed so as to ensure that each district of Maputo City had more than one container for the removal of waste (Municipality of Maputo City, 2008).

Although there is a private company working on the removal of these containers, the problem of removal continues, as it is highly dependent on the low availability of vehicles for waste collection. Containers and vehicles are not sufficient for the collection of solid waste generated in these areas due to the Municipality's financial difficulties (Municipality of Maputo City, 2008).

Within the districts there is almost no municipal service. In two districts only, namely Maxaquene and Urbanisation, there is a primary collection system, where the collection of waste is done through a system of door-to-door or several fixed points of collection. In

other areas, the districts collect and transport municipal solid waste with tractors to the dumpsite (Municipality of Maputo City, 2004).

In some neighbourhoods, the residents burn or bury the waste generated in their yards due to absence of waste collection.

1. Rural areas

In rural areas, on the outskirts of Maputo City, there is no collection service of solid waste. In these areas, residents use traditional forms of treatment and disposal of municipal solid waste, namely burying, burning or feeding it to animals and pets. With the population growing each year, the production of waste is also contributing to the increase of the rate of proliferation of informal dumpsites.

Table 4.2 illustrates domiciliary cleanliness fees charged to Mozambican citizens by the Municipality of Maputo City.

Table 4.2: Domiciliary cleanliness fees charged to Mozambican citizens (Municipality of Maputo City, 2008)

Electricity of Maputo (EDM)	**Monthly fee**
0 to 200 kwl per month	30 MT
201 to 500 kwl per month	45 MT
More than 500 kwl per month	65 MT
Social tariff	10 MT

4.3.9 Removal of other types of solid waste in industry, trade and markets

Private companies perform the removal of solid waste from commerce, industry, trade and markets, where waste is produced in large quantities. Private companies, who want to participate in solid waste management, specifically the collection of waste, have to obtain a license issued by the City Council, which allows them to carry out activities in the management of municipal solid waste within Maputo City (Municipality of Maputo City, 2008:30).

Most non-residential solid waste, especially in the economic centre of the city, is placed in containers to be collected. However, due to containers being full and overflowing, the waste is then placed on the ground or on the street. In an effort to avoid this and to promote private sector participation, the City Council in 2005 introduced the system of proof of service. All producers who are not at home and whose daily output exceeds a set amount (currently 25 or 50 kg per day), have to prove to the Department of Municipal Services, Health and Salubriousness that their waste is properly removed by a licensed company that charges a fee related to the amount of waste they produce. The system is still in its early stages and covers only about 5% of potential customers (Municipality of Maputo City, 2008:35).

The 6- and 10-m^3 containers of the Department of Municipal Services, Health and Salubriousness serve both formal and informal markets. Currently, the removal is irregular due to the lack of trucks, skips or roll-on/roll-off services. The remaining public markets use containers or deposit the waste in informal dumps (Municipality of Maputo City, 2008:23).

4.3.10 Hospital waste

Maputo Central Hospital has incinerators to destroy waste completely, but quantities of hospital waste to be destroyed are not specified yet. Some hospitals located in the districts dump their waste in the legal dumpsite situated in Hulene, this destruction of waste is often not completed and the informal sector goes back to collect some hospital waste and sell in the informal market (Municipality of Maputo City, 2008:32).

Some centres on the outskirts of the city bring their waste to the Mavalane General Hospital for further destruction or pits are opened for destruction (burning) within its precinct. Other health units located in the suburban areas dump waste in abandoned opened spaces. The transport of waste is not done in special-purpose vehicles; it is often the same vehicle used to transport patients and/or medication (Municipality of Maputo City, 2008).

Although the Ministry for the Coordination of Environmental Affairs is responsible for regulating matters related to hospital waste and hazardous waste, it does not have sufficient control over the waste produced in hospitals and private clinics because there are not enough inspector to monitor what happen with this type of waste.

Some hospitals waste, such as corpses that are not claimed, are buried in mass graves located in Lhanguene Cemetery (Municipality of Maputo City, 2008).

It is estimated that health centres located in the suburban area each produce about 60 to 80 m^3 of waste daily, but only 25% gets collected and destroyed, 65% is dumped in illegal dumpsites (Municipality of Maputo City, 2008).

4.3.11 Final treatment and disposal of municipal solid waste

There is currently no organised treatment of solid waste in Maputo City. As explained, in the areas without a collection service, people use traditional ways of disposing of municipal solid waste, but the traditional ways aggravate the impact on the environment. Such treatment should cease with the implementation of the programme of the municipal solid waste management. There are several solutions for treatment, such as composting, but these have not yet been implemented (Municipality of Maputo City, 2008).

4.3.11.1 Legal dumpsite

Maputo City has only one official dumpsite. All the waste collected in the city is dumped in Hulene. This official dumpsite is in a densely populated neighbourhood, approximately 20 km from downtown and adjacent to the airport. The site has an area of about 17 acres and a height of solid waste deposited between 6 and 15 m (Municipality of Maputo City, 2008).

The dump is open for 24 hours a day. Currently, it can accept deposits of 283 050 tons of solid waste per day. Since August 2006, all received waste at the dumpsite is weighed on the scales installed there. The machines available are an old bulldozer weighing 25 tons and a new one weighing 14 tons. They run for roughly six to eight hours per day, depending on the fuel available. The entrances to the dumpsite were renovated in 2007 to mitigate the negative effects on traffic, especially in rainy weather (Municipality of Maputo City, 2008).

The discharge of waste is carried out without much control and with little compression. There is no coverage of the deposited waste, which allows access to pickers of solid waste. Waste pickers often complicate the operation of the trash because they burn the solid waste to pick up useable

materials such as metal, tires and cables that are very close to or even inside the trucks at the time of discharge. Residents of nearby neighbourhoods complain of air pollution, flies and other vectors (Municipality of Maputo City, 2008).

4.3.11.2 Illegal dumpsite

Due to inadequate solid waste collection, all types of waste are found in several places in Maputo City with unlawful accumulation of solid waste along the streets and in various ravines. Near the official dumpsite (500 m away), there is a large hole that was converted into an illegal dumpsite. Not only are the local and surrounding habitants using this site, private companies also use it to avoid payment for the use of the official dumpsite. In Xiquelene Market, there is a similar place that was created after the floods recorded in 2000. Most individuals use this place to dump all types of waste without local authorities' permission and/or concern (Municipality of Maputo City, 2008:33).

4.3.12 Private sector involvement

Previously, the private sector played a small role in the management of municipal solid waste in Maputo City, but since 2007 several private companies operate in the formal sector of Maputo and Matola, where they offer their services for the collection of solid waste in trade and industry (Municipality of Maputo City, 2008:33).

As explained above, these companies have to apply for a licence to the City Council, represented by the Department of Municipal Services, Health and Salubriousness, to perform services related to cleaning the city. The City Council recognises the capability of the private sector and uses this to address solid waste-management problems and pollution of the environment.

A non-profit association and a micro company from the informal sector perform the primary solid waste collection in two suburbs, Maxaquene A and Urbanisation. These organisations signed a contract in 2004 with the City Council to run this service in their neighbourhoods and to get paid for it by the City Council. These projects employ a very positive model, which is why the multiplication to suburban neighbourhoods is in heal (Municipality of Maputo City, 2008).

4.3.13 Strategies to combat waste

According to Aktipis (2007:18) in the Global Report (2007), the best way to minimise the amounts of waste produced in Mozambique is through the Integrated Solid Waste Management System, which is based on the 3 Rs (reduce, reuse and recycle) principle.

4.3.13.1 Activities in the area of reducing, recycling and reusing and other forms of exploitation of solid waste by the Municipality of Maputo City

In the Directorate Plan for Solid Waste Management (Municipality of Maputo City, 2008) it is stated that, in the area of utilisation of solid waste, there are three levels to be analysed, namely reduce, reuse and recycle.

a) Reduction of production of municipal solid waste: The method can mainly be used in the process of manufacturing goods and through the behaviour of residents who can decide to buy only products that produce less solid waste. Increased awareness of the population about this issue is a long-term process that includes intense campaigns of civic and environmental education. The process of reducing the production of waste requires the use of technologies, which are expensive; however, the Municipality is required to use the process that reduces the cost of materials. The Municipality does not have enough resources as, for example, the use of

different packaging would mean a major change for the economic sector. These processes last a long time and usually require high investments. The activities in this direction are very few; some NGOs begun to engage in this area (Municipality of Maputo City, 2008: 33).

b) Reuse of municipal solid waste

Many residents use this method to minimise waste in their homes. It is common in Maputo City to find members of communities reusing all types of urban solid waste because of low socio-economic conditions. People are obliged to re-utilise furniture, bottles and plastic, and to use organic waste to feed animals. A large number of residents are obliged to apply this method due to financial difficulties. Practically, the government of Mozambique does not promote initiatives for reduction and re-utilisation of solid waste and consequently people apply the method individually.

c) Recycling of municipal waste:

Recycling is the separation of products for their possible conversion into new products, for example plastic, cans, paper, bottles, metals and other materials. According to the Municipal Council of Maputo City (2008:32), the recycling process is not developed in a formalised and systematic way, but there are recycling initiatives in the commerce and public sectors.

Some companies buy white waste paper and cardboard to export to Swaziland and South Africa. This also happens in the case of metals and plastics (Municipality of Maputo City, 2008).

The market for glass does not exist, as the local factories have closed. The exportation of this material is associated with great risks for exporters (quality of material, export taxes and high shipping costs) (Municipality of Maputo City, 2008).

Ferrous and non-ferrous metals are collected by the informal sector as well as specialised companies. The material is exported. Currently, there is no initiative to make new metal products in Mozambique.

The market for recyclables varies greatly, depending on international prices for products. Therefore, the situation has worsened, and on the whole, some companies have stopped the collection of cardboard because of its low price (Municipality of Maputo City, 2008). The situation is better for ferrous and no-ferrous, which currently has a high value.

With the support of the Deutsche Gesellschaft für International Zusammenarbeit (German Agency for International Cooperation) and Caritas de Mocambique, the Municipal Council of Maputo City has developed a pilot project for the separation of plastic near legal dumpsites, using the capacity of collectors in the informal sector. Next to the legal dumping site in Hulene, the Municipality has installed a centre for the treatment of plastic, which is called the Treatment Center Plastics (RECYCLE), where a group of collectors are trained and supported.

4.3.14 Public awareness and civic education

The City Council has developed strategic civic education in the management of municipal solid waste. The need for the development of the strategy arose from the recognition of existing gaps in the transmission of information about solid waste-management regulations and rules, which in turn contributes to the almost universal lack of knowledge by the citizens, and thus for their inappropriate behaviour. The strategy was adopted in order to educate the general public on how to deal with waste from homes to bins where waste is deposited (Municipality of Maputo City, 2008:53).

4.3.15 Participants in the activities of solid waste management

In Maputo City, there are participants involved in some activities pertaining to solid waste management. These are discussed below:

- AGRESU is a German organisation that cooperates with the Mozambican government with the aim of giving technical assistance and advice to the Municipal Council of Maputo City in all aspects related to solid waste management
- The World Bank and PROMAPUTO work together to develop a programme for the improvement of cleaning services in the city
- The project GMA EMS (Environmental Management Strategy in the Greater Maputo) is funded by DANIDA
- The Environment Fund (FUNAB) is responsible for training environmental educators in the management of solid waste management
- The Association Livaningo holds public meetings on the issue of legal dumpsites to discuss the future of the legal dumpsite in Hulene
- The Support Centre for Industrial Development (CADI) and the National Centre for Cleaner Production (CNPML) participate in the formation of small service providers gathering with primary financial support from UNIDO
- Several organisations, such as Caritas and LVIA Mozambique (an NGO from Italy) support cooperation projects that deal with recycling materials (Municipality of Maputo City, 2008).

4.3.16 Staff

The Directorate of Municipal Services, Health Commission has staff and workers to manage solid waste. However, the inefficiency of solid waste management still remains. The reasons for continued inefficiency are as follows:

- The wages are relatively low compared to those in the private sector. For example, a worker in the collection of solid waste gets about a third or half of the salary of a person employed by the private sector.
- The levels of qualification are very low due to a lack of resources to ensure a programme of training and adequate training for staff functions (Municipality of Maputo City, 2008).
- The Municipality of Maputo City shows a lack of leadership and management at various levels due to the lack of qualified personnel in the area of planning and management (Republic of Mozambique, Directorate of Municipal Health Services, 2008).
- There is resistance to change and a lack of motivation of staff at all levels. The reason for the resistance to change is that people interpret the changes in existing structures as a risk to their job or as a way to work their way up.
- There is resistance to participation of the private sector. The experiences with privatisation and the provision of services by the private sector in Mozambique, and specifically in the management of municipal solid waste in Maputo City, were not positive (Municipality of Maputo City, 2008).
- There is a lack of financial resources. This failure is caused by the overall financial deficit of the Municipality. The revenue generated by the Municipality (for example the cleaning fee) does not cover current expenses (Municipality of Maputo City, 2008).

4.3.17 Budget and fund management

The tax office of the Directorate of Municipal Services, Health Commission performs the management of financial resources. This directorate is not independent in its budgeting and financial management (Municipality of Maputo City, 2008:26).

The Electricity of Mozambique collects the cleaning fees by billing their clients and delivering the receipt of payment every month to the central treasury (Municipality of Maputo City, 2008).

The budget for the coming year is determined in September of each year. This includes all expenses and miscellaneous revenue from the Department of Municipal Services, Health and Salubriousness (Municipality of Maputo City, 2008:26). The changes to the budget are quite complex, thus hindering a dynamic and flexible management of scarce financial resources.

For consideration of the relationship between revenue and expenditure, in relation to the management of municipal solid waste, one has to analyse the different services offered by the Department of Municipal Services, Health and Salubriousness. In addition to costs directly related to the collection and transportation of solid waste, the costs of operational facilities should also be included.

4.3.18 Rates to consider when calculating the fees to be paid by individuals and public and private institutions

Several rates have to be considered to calculate the total value of municipal waste:

- Domiciliary cleaning fee: This is the rate that individuals living in Maputo City have to pay for cleaning services provided by the City Council. Currently, the Electricity of

Mozambique charges the fee. In May 2007, the old system that consisted of a value of 20 MT per family (normal rate) and 5 MT per family (social tariff) was changed (Municipality of Maputo City, 2008).

- The rate follows the principle of "those who have more pay more" and introduced an awareness of high costs for cleaning services with the new rate of cleaning.
- Cleaning fee by "proof of service" indicates the rate that all public or private institutions that have a production output significantly above the domiciliary must pay as a contribution to cleaning the city. The monthly fee depends on the quantity produced and is charged directly by the Electricity of Mozambique. All private and public institutions pay a fee based on the electricity invoice. These rates vary between 50,00MT, 100,00MT and 150,00MT per month (Municipality of Maputo City, 2008).

4.3.19 Collection system

For the collection system to be effective, all producers of solid waste and cleaning services must always be connected to all activities related to solid waste management. The residents of Maputo City must also follow the designed plan of the collection system, taking into account the following aspects: the topographic features, the type of paving of roads, the direction and intensity of traffic, the definition of the zones within the city, the number of inhabitants and the average number of residents, the production and quantity of solid waste, and the customs of the population (Rodrigo, 2004:32).

4.3.20 ProMaputo Programme

ProMaputo is a programme supported by the World Bank. The project's objectives is "to

strengthen the capacity of the city council to develop, solid waste and maintain quality service delivery to citizens" (World Bank, 2007:1). Another objective is "to strengthen the Municipality's institutional and financial capacity of long-term service delivery goals and to implement selected priority investment" (World Bank, 2007:1).

The project includes the following components: "Component A incorporates an institutional development and municipal governance; Component B includes municipal finance; and Component C incorporates planning and service delivery" (World Bank, 2007:1).

4.4 CHAPTER SUMMARY

Mozambican citizens generate large amounts of solid waste, which end up in the only legal dumpsite, in illegal dumpsites or are buried and burnt. Trucks and wheelbarrows transport waste generated in Maputo City.

The responsibility for all services related to solid waste management is in the hands of the Municipal Council of Maputo City, NGOs, associations and a few private companies.

CHAPTER 5

THE EVALUATION OF SOLID WASTE MANAGEMENT IN THE MUNICIPALITY OF MAPUTO CITY

5.1 INTRODUCTION

This chapter discusses the development of the research design used to evaluate solid waste management in the Municipality of Maputo City and identifies the key players involved.

5.2 THE EVALUATION OF SOLID WASTE MANAGEMENT IN THE MUNICIPALITY OF MAPUTO CITY

A research design is an official plan followed by the researcher to investigate a specific problem that affects the society (Trochim, 2007:955).

The two main aims of the research design are to help researchers set out their research questions, methodologies, implementation, procedures, data collection and analysis of the study, and to ensure that the proof obtained allows the researchers to respond to primary questions (Trochim, 2007:955).

Trochim (2007:957) highlights three types of approaches, namely quantitative, qualitative and a mixed-methods approach. Smith (2003:1) argues that "more people are interested in using research approaches in order to collect data from participants concerning a topic of interest, and then write a report of what they had said using words". Bless, Higson-Smith and Kagee (2006:71) state that the research design is a specific plan designed to conduct adequate operations in order to collect accurate data.

According to McMillan and Schumacher (2001:396), the research design is "concerned with accepting the social phenomena from the participants' perception with interactive strategies, i.e., using in-depth interviews, participant observation, and supplementary techniques".

5.2.1 Qualitative research

Qualitative research is a method that allows researchers to interpret and acquire a better understanding of the realism of a specific situation (Berry, 1999:4). In qualitative research, researchers are able to use methods such as in-depth interviews, focus group discussions, questionnaires, documents, texts and participant observation. Each type of method is appropriate to gather accurate information.

According to Myers (2007:4), qualitative researchers can be found in many disciplines and fields. Following this method, researchers are able to use a variety of techniques. The author states that qualitative methods are developed in social science to help researchers to study social and cultural events. Trochim (2007:955) states that qualitative researchers use qualitative research to describe events. The method encompasses the collection of a variety of social indicators and economic information.

The description of events or situations can be concrete or abstract. A concrete description helps to describe the ethnic mix of a community and allows asking more conceptual questions.

5.2.1.1 Purpose of qualitative research

Qualitative research is a methodical study that enables researchers to answer questions, and it

allows for producing results that were not dogged in advance. According to Berry (1999:2), qualitative research helps to comprehend a given research problem that affects a society.

Qualitative research allows researchers to report how citizens feel about the problem they face. It is also effective in obtaining information about values, opinions, behaviours and the social context of a particular population. The main domain of qualitative research is to determine themes based on participants' meanings, and to develop in detail a notion for prospect in research (McMillan & Schumacher, 2001:397).

5.2.1.2 Differences between qualitative and quantitative research

There are differences between qualitative and quantitative research. In qualitative research, the researchers use words to describe events and the topic, while in quantitative research, information obtained is expressed in figures (Henninger, 2009:1).

5.2.1.3 Characteristics of qualitative research

According to Key (1997:10), the main characteristics of qualitative research are: a) exploratory and descriptive; b) emergent design; c) data collection in the natural setting; d) emphasis on humans as instruments; e) qualitative methods of data collection; and f) early and ongoing in inductive analysis.

5.2.2 Research questions

Questions are posed in order to understand how participants explain a phenomenon, describe and explain their problems, and take positive actions. This helps to know what is occurring in the social situation, and to discover how the categories and themes of participants' meanings, as well

the events, beliefs, attitudes and policies, impact on the phenomenon (McMillan & Schumacher, 2001:397).

5.2.3. Reasons for collecting data

Researchers collect data to be able to respond to specific questions whose answers are not instantaneously available or clear, and to be able to discover questions for further investigation (Slowinski, 2000:1).

5.2.3.1 Methods of collecting data

Before collecting data, researchers need to decide whether information will be gathered through using questionnaires, focus group discussions, case studies, in-depth interviews or the collection of relevant documents, photographs and video tapes. Welman, Kruger and Mitchell (2007:193) suggest that at the time that the researchers conduct a study on groups or institutions, they must carry out fieldwork based on the topic being studied.

McMillan and Schumacher (2001:41) state that in qualitative research, researchers collect data primarily in the form of words rather than numbers.

5.2.3.2 Coding data

Coding is a method of breaking data up. Qualitative researchers use descriptive coding to store information about data items gathered from respondents, events or contexts (Richards & Morse, 2007:138). The researcher obtains knowledge about the respondents' responses by using gender, age and qualifications. Descriptive codes involve minor interpretation based on the meaning that the researcher gives to what others have written about the matter being investigated.

5.2.4 Data analysis and interpretation

After devising a scheme for the study, recruiting participants and conducting the research, data need to be organised in an appropriate manner so that analysis can be done. According to Mouton (2006:108), all fieldwork needs to be examined and interpreted. Examination involves breaking up the data into convenient themes, patterns, trends and relationships, while interpreting data means explaining, clarifying and giving meaning to what others have said.

The objective of examining the data is to easily recognise the many elements of data through making an assessment of the interaction among concepts, and to see where there are any patterns or trends that can be recognised or cut off, in order to set up themes based on the information Kohlbacher, 2006:13).

There are many ways for researchers to analyse data. Some researchers use paper and pencil methods, or calculators, while others put in order the notes made on cards and paper that indicate ideas gathered from questionnaires or interviews (Gaiser & Schreiner, 2009:113). The researcher codes data by using symbols that assign and identify words to express meanings of the words.

"Qualitative research can take a variety of forms; some focus on as little analysis as possible while others use various types of scheme to develop theories and findings" (Gaiser & Schreiner, 2009:114).

5.2.5 Evaluation of solid waste management

To evaluate solid waste management within the Municipality of Maputo City, the researcher chose a specific methodology suitable to evaluate solid waste management. The methodology

applied was qualitative research. De Vos, Strydom, Fouché and Delport (2005:269) argue that qualitative researchers decide on the approach that is suitable to their research project. Kayrooz and Trevitt (2005:111) state that when using a qualitative approach, the researcher is doing a revision of the existing information, talking about what is happening regarding the problem that is being investigated, interacting with people facing the problem, coding and analysing information, and explaining what the topic is all about, to be able to bring meaning to what is happening.

By using a qualitative approach, the researcher was able to understand and describe what is happening in terms of solid waste management in the Municipality of Maputo City; to know the feelings, perceptions and opinions of Mozambican citizens regarding solid waste management within the Municipality of Maputo City; and to do an analysis and interpretation of the gathered data. According to Hopf (2004:334), "qualitative research must be planned in order to report what is happening in the field". De Vos et al. (2005:269) say that "qualitative research seeks knowledge in ways that are systematic, replicable, and cumulative" and according to Lani (2011:1), "a qualitative approach focuses on group's experiences in their own words; it also tends to confirm researcher's own understanding of a phenomenon".

5.3 METHODOLOGY EMPLOYED FOR EVALUATING SOLID WASTE MANAGEMENT WITHIN THE MUNICIPALITY OF MAPUTO CITY

Methodology refers to the method used by the researcher to explain the plan of the study, the choice and description of the study, the position, the time and the extent of the study, the number of participants involved and how they were selected, and the data-collection and analysis strategies (McMillan & Schumacher, 2001:55).

In order to evaluate solid waste management within the Municipality of Maputo City, the researcher used a qualitative approach to be able to describe, understand, interpret and give meaning to the phenomenon, namely solid waste management. To explain the problem that the Municipality of Maputo City and its residents are facing, the researcher looked at the participants' problem, which is how solid waste management affects their lives.

5.3.1 Techniques applied for data collection

According to McMillan and Schumacher (2001:395), "interactive qualitative research is an inquiry in which researchers collect data in face-to-face situations by interacting with selected persons in their settings (field research)". Struwig and Stead (2001:98) argue that by using structured interviews, semi-structured interviews or in-depth interviews, the researcher is able to achieve the desired outcomes of the study.

Before the interviews took place, the researcher designed an interview schedule (i.e. a script containing the questions to be asked during the interview). The interviews took place at the Municipality of Maputo City, specifically at the Department of Municipal Services, Health and Salubriousness. Interviews were conducted on 6 and 7 October 2010. Three managers and 22 public officials were interviewed. All participants were required to indicate their opinions in a clear and understandable manner. The researcher used in-depth interviews. These interviews were used to help the researcher obtain raw information on solid waste management. Interviews were recorded in Portuguese and responses were translated into English. The participants were given the assurance that their identities would be protected and that all the information would be treated confidentially.

5.4 DATA ANALYSIS, INTERPRETATION AND PRESENTATION OF RESULTS

The data were analysed using content analysis. Content analysis is defined by Stemler (2001:1) as a "systematic, replicable technique used for compressing many words of the text into fewer content categories based on explicit rules of coding".

5.4.1 Interview

The following section focuses on the questions and responses given by the participants.

Q1. Do you think that current solid waste management in Maputo City is effective?

Response

Ten participants thought that currently, solid waste management has improved substantially due to integration of individuals, associations and private entities in the process of collecting and removing trash from residences and streets to the communal containers, while other trash is taken to the official dumpsite.

Fifteen participants revealed that solid waste management within the Municipality of Maputo City is not effective.

Q1.1 If no comment

The participants commented that there were many reasons contributing to ineffective solid waste management. The major reason was attributed to –

- theft of containers by some city dwellers living in Maputo City;

- corruption, where nominations to high positions are based on political affiliation and friendship;
- unqualified and untrained staff;
- low salaries;
- inadequate implementation and enforcement of solid waste-management policies; and
- the incapacity for running collection transports to the collection points.

Interpretation

The question was raised in order to identify whether solid waste management within the Municipality of Maputo City was effective or ineffective. It emerged that the participants had different opinions. Therefore, the Municipality needs to find more alternatives to dealing with solid waste, as not all participants were satisfied with the Municipality's effectiveness.

Q2. What are the Municipality's current strategies to deal with solid waste management?

Response

A current important strategy adopted by the Municipality of Maputo City to deal with solid waste management is the strategic plan known as the Master Plan. The plan serves as a guide and a basic tool for the management of all waste produced in Maputo City. Furthermore, the plan provides for all activities that have been followed since 2007 as well as the activities to be followed until 2017. However, when the participants who were not managers were asked this question, they were unable to mention the current strategies of the Municipality.

Interpretation

The question was raised in order to establish perceptions of solid waste management strategies and goals adopted by the Municipality of Maputo City. From the research, it was revealed that some participants were not aware of what was being done to deal with solid waste. This is because they have not been informed about the Municipality's current and future plans. Information was not cascaded to all employees of the Municipality, as it was only provided to those in management positions. Hence, some employees only knew that their job was to collect and manage waste, but they were not informed of the methods and plans that were put in place. Therefore, managers need to find ways to provide information to all employees.

Q3. What are the Municipality's future strategies and goals to deal with solid waste management?

Response

It was revealed that the Municipality's future strategies are to train and educate employees, increase cleaning fees and develop new landfills. It was also revealed that the future goals are to make Maputo City the cleanest and most hygienic city in Mozambique, to attract more investment and to increase the quality and range of cleaning services using institutional tools available.

Interpretation

The question was asked to check whether employees were able to identify the main future strategies and goals to be followed by the Municipality of Maputo City in the following years. The responses indicated that all employees were aware of future strategies and the outcomes to be achieved by the Municipality of Maputo City. The Municipality of Maputo City is continuing

to draw strategies that in future may change the gravity of solid waste management. The responses also indicated that the Municipality of Maputo City has goals to achieve from 2008 until 2017. Therefore, the Municipality has sound strategies for the future, but the question is whether it has the appropriate means to achieve such goals and to what extent it will achieve the goals that were set.

Q4. Which strategies should be adopted by the Municipality of Maputo City to minimise waste produced in the city?

Response

The participants revealed that there are many strategies that the Municipality could adopt to minimise waste. These strategies include educating households on how to deal with waste produced from homes; creating environmental education programmes and spaces where the public can be educated on what to do to with waste produced at home and changing the existing processes and systems applied by the Municipality. This can be done by planning all future activities bearing in mind the current waste-management situation as well as future objectives and goals to be achieved. Waste should be treated from homes where it is first produced: Waste must be selected and separated according to what is useful and what is useless and then be put in containers according to whether it is paper, glass or metal.

Before the implementation of the strategies, the following factors need to be studied carefully: the urban centre, population density, the characteristics of solid waste produced, the volume of waste produced, the types of vehicles to be used, collection and transport routes to the dumpsite,

existing human resources and the dominant types of activities, habits and customs of the population (types of food they eat and the climate).

Interpretation

The question was posed to employees to identify strategies that in future could help to minimise waste in Maputo City. The participants indicated that they were concerned with the strategies that the Municipality could adopt to reduce waste in the city. The responsibility of planning, organising, leading, controlling, evaluating and taking corrective actions is that of the Municipality of Maputo City; hence, there is a need to take corrective measures in order to change the face of solid waste management.

Q5. What should be done to implement and enforce solid waste-management policies in the Municipality of Maputo City?

Response

It was revealed by all the employees that, for the implementation and enforcement of policies to be achieved, it requires that the institutions be effective in terms of the management, implementation and development of policies. The participants also indicated that the staff dealing with policies should be effectively trained to be able to interpret what the policies say and to be able to apply these policies. Inspectors should be educated in order to prevent corruption when it comes to enforcement.

Interpretation

The question was raised in order to get an idea of what can be done to implement and enforce the

law within the Municipality of Maputo City. All the employees had some idea of how to enforce and implement the policies.

Q6. Do you think that there is a need for personnel training in the area of solid waste management?

Response

It was revealed by participants in management that staff at all levels are not trained, and they felt that there is a need for training all employees in order to reach capacity building to change the face of solid waste management. The lack of training was attributed to a shortage of financial resources.

Interpretation

The question was raised in order to identify whether solid waste management staff within the municipality need to be trained. The management felt that poor staff training is motivated by a shortage of resources.

The methods that will be used to train employees were not specified. Therefore, even though management realised that training was required, they did not place it as a priority.

The following section focuses on the focus group discussions.

5.4.2 Focus group discussions

From 150 residents (parishioners from three churches, namely the Assembly of God, Nossa

Senhora das Graças and the Metodista Unida de Moçambique), a sample was selected with the intent of being able to make a judgement about their thinking, feelings, perceptions and comments regarding waste management in the Municipality of Maputo City. This was done using open-ended questions. The ages of the participants ranged from 20 to 55. The qualifications they held ranged from a Grade 9 high school certificate to a university honours degree. Out of each church group, a random sample of 10 persons for three different focus groups was selected. The sample represented citizens from areas that included Polana Cimento, Alto Mãe and Chamanculo. The researcher as a facilitator of the group discussions spent approximately one hour with each group. The discussions were conducted in Portuguese and the information was then translated into English. The focus group sessions took place at the three respective churches to ensure an environment free from noise and other distractions. During the focus group sessions, the researcher recorded all relevant information and took notes. The aforementioned churches were targeted, as it was convenient for the participants to access the selected churches easily due to the proximity of their residences.

The following section focuses on a discussion of the posed questions and the responses captured.

Q1. What are your perceptions of solid waste management by the Municipality of Maputo City?

Responses

Focus Group A's perception was that solid waste management by the Municipality of Maputo City was a disaster. The municipality could not manage waste in an appropriate manner so the

city was full of waste everywhere and containers were overflowing. This demonstrates that the Municipality was incapable of managing solid waste.

Focus Group B's perception was that the Municipality has failed to perform its tasks, so the city was seen as one of the 25 countries known as very dirty and that the situation was made worse because poor solid waste management caused garbage stench, which bothered the residents in Maputo City.

Focus Group B added that, with the amount of waste increasing in Maputo City, the situation would hinder the development of tourism and would limit the participation of a variety of investors in Mozambique.

Focus groups A and B believed that there was nobody in the world who would want to invest in a country where the streets are full of garbage and potholes.

Focus Group C revealed that from 2008, the Municipality has tried to minimise poor solid waste management, but so far (i.e. until 2010) has not yet reached the objective identified by residents, which was to see the city as clean as it was during the colonial period.

Focus Group C was also of the opinion that the Municipality of Maputo City was working hard to improve solid waste management. In 2001, the situation of solid waste management was at its worst, but since 2006, solid waste management has improved substantially due to the Municipality changing the processes and the systems that it followed since Mozambique became independent.

Interpretation

The discussion was raised in order to identify perceptions of solid waste management within the Municipality of Maputo City. Focus groups A, B and C demonstrated that they had a clear understanding of solid waste management within the Municipality of Maputo City, although they differed in their perceptions of its management.

Solid waste management is a sensitive matter that requires special attention by the Municipality of Maputo City. The municipality needs to work hard to change the current situation of solid waste management.

Q2. What do you suggest the government should do to improve solid waste management?

Responses

To improve solid waste management, Focus Group A suggested that the government should first resolve the problem of corruption and then delegate credible public officials who work in the Department of Municipal Service, Health and Salubriousness to visit developed countries that manage solid waste effectively to become aware of the procedures, systems and technologies used in those countries and to apply these in the country, taking into account the technological, economical and financial situation of Mozambique. Focus Group A also felt that there was a need for the Municipality to conduct a population census periodically to determine how many residents inhabit Maputo City and to update the data system of solid waste management in order to plan solid waste-management activities effectively.

Focus Group A also suggested that the government should adopt a mixed system where public and private sectors join together and operate together to resolve the problem of ineffective solid waste management. Each party can come up with innovative and creative ideas that can be put

into practice. They believed that a mixed system would allow the different parts to work together, be accountable and transparent, and to combat corruption and mismanagement.

Focus Group A also suggested that the Municipality of Maputo City should adopt waste-reduction methods to solve the problem of solid waste management. The method was considered a good idea, but it would require that the Municipality of Maputo City approach the manufacturing companies to substitute polluting products with non-polluting products.

Focus Group B suggested that to improve solid waste management and matters pertaining to environmental management, children should be taught from Grade 3 to higher education that waste should be prevented to increase their knowledge and promote improved habits.

Focus Group B also suggested that some areas should be given to the associations and small business enterprises, where both could be allowed to operate in the collection processes up to collection points. From the collection points, the Municipality and private sector could take the responsibility to take trash to the dumpsite.

Focus Group B commented that in Maputo City, the major producers of waste were women and the youth, due to the large amounts of clothes, shoes and bags they buy. The group suggested that women and the youth be involved in the process of solid waste management because they can play an important role in improving solid waste management and should become more aware of the issue.

Focus Group C suggested that waste treatment should primarily take place at home and by the household, where waste should be selected and separated according to what is useless and be put

in containers according to its classification. Before the waste is removed from the home, it needs to be arranged properly so as to not bother residents who live close to the dumpsite.

Focus Group C also suggested that the government should encourage the creation of educational programmes and should mobilise everyone to take part in all activities pertaining to solid waste management. To do this, members of communities and the youth should be involved and be responsible for marketing the programmes. Meetings should be held every Saturday in the districts to explain how waste should be treated. The Municipality should mobilise people to do volunteer work once a week to be able to keep the areas where they live clean and beautiful.

Focus Group C was also of the opinion that solid waste management could be achieved through planning all activities. When planning, the Municipality of Maputo City should study the following aspects carefully:

- the urban centre;
- population density;
- the characteristics of solid waste produced;
- the volume of waste produced;
- the types of vehicles to be used;
- collection and transport routes to the dumpsite;
- existing human resources; and
- the dominant type of activities, habits and customs of the population (types of food they eat, for instance) and the climate.

Focus Group C was also of the view that recycling is one of the ways that the Municipality could apply to reduce waste in Maputo City.

Lastly, Focus Group C suggested that the Municipality of Maputo City should only operate at the hospitals and in areas where disadvantaged people stay, taking responsibility for all services, while the private sector should operate only in the zones in which rich people reside, in commerce and in institutions, as affluent people are able to afford the high fees charged by the private sector.

Focus Group C also suggested that the creation of inter-municipal associations could lead to the improvement of solid waste because both can work together by means of checking and controlling activities. The municipal councils of Maputo City and Matola should ensure that the tasks are performed adequately and that both are accountable and transparent.

Interpretation

The question was raised in order to help the researcher collect different opinions on the improvement of solid waste management, which could assist the Municipality in improving solid waste management by using the ideas of the groups.

It was revealed that all focus groups had great ideas on how to improve solid waste management by the Municipality of Maputo City and to change its current image. It is clear that changing the current processes followed by the Municipality of Maputo City could lead to effective solid waste management and would help to minimise waste. Moreover, changing the location of the official dumpsite could contribute to ease of access, as it will be positioned near where electricity

is produced so that waste can be treated using modern forms (incineration) and where the soil is impermeable and no residents live nearby.

Waste reduction could be an adequate way to reduce waste, but it involves changing the manufacturing activities so that waste may be minimised.

Q3. Do you think that the current solid waste management is benefiting every citizen?

Response

All group members were of the view that the majority of residents do not benefit from waste collection regularly. To cope with waste generated from homes and for health protection, residents throw their garbage in the pavements or burn it outdoors, while those with transport sometimes take it to the dumpsite. All focus groups commented that it is common practice to dig holes in the backyards and dump waste or burn it outdoors. They were aware that using traditional methods were destroying the environment because the smoke and particles produced compromised the safety of the earth, contributing to damage of the environment and putting people's health at risk.

Interpretation

The question was raised to determine the common ways used by the residents to dump waste. All focus groups indicated that the majority of residents practise traditional methods of dumping waste. All focus groups were aware that they were destroying their life and the environment.

Waste management is the process involved in dealing with the waste of communities and institutions. Waste management reduces the impact on the environment. The traditional methods

of waste management are incineration and landfills; however, both pollute the environment. Despite not being a best practice, reuse is one of the ways that the communities can use to minimise the amount of waste that should go to the dumpsite.

Q4. Do communities ever get involved or participate in solid waste-management activities?

Response

All focus groups were of the view that few community members were involved or participated in solid waste management. Although the involvement of communities is a suitable method that can help to minimise waste, the municipality had not yet expanded the involvement of many citizens in some solid waste-management activities.

Interpretation

The question was raised in order to measure perceptions of communities' involvement in solid waste-management activities. The involvement of communities in solid waste management is one of the basic methods that has helped to minimise waste and has allowed disadvantaged communities to improve their life through earning an income to feed family members.

Q5. How do communities deal with solid waste produced from homes?

Response

All focus groups revealed that to deal with waste generated from homes, each household collects all its waste at the end of each day. This is then placed in bags, boxes or other types of container, and taken to the communal container, which gets collected by the municipality truck.

Interpretation

The question was asked to get information on how communities deal with waste produced from homes. It was indicated that, within communities, each household used different types of material to place waste, which then ended up in communal containers, to be collected by the Municipality. It was also clear that the Municipality of Maputo City has not yet introduced the use of specific plastic bags in which to place specified waste. The method used to deal with waste generated at home did not help the households to separate waste. Different type of bags or containers was used to contain the waste.

Finalising the discussion, all focus groups suggested that the government should involve all community members, civil society and academics to take part in the decision-making process, because they felt that the communities were being ignored in the decision-making process. For example, when the government decides to make changes, introduces new policies or increases the rates, they do not involve the citizens. All focus groups also suggested that to improve solid waste management, the Municipality of Maputo City should transfer the official dumpsite located in Hulene to Namaacha district, because offers better conditions and is located in an appropriate area.

In addition, all focus groups suggested that the Municipality should review solid waste-management policies and appoint public officials that are able to enforce the proposed policies.

In order to interpret the findings, an evaluation key was used. This method was used in order to apply a grading system to all the answers that were given to the questions asked by the researcher.

Table 5.1 below shows the evaluation key that was used.

Table 5.1: Evaluation key used

Evaluation key	Definitions
O	Outstanding (terrific, exceptional, excellent)
V	Very good (great, but still needs a bit of work)
N	Needs improvement (requires development, upgrading)
U	Unsatisfactory (not up to scratch, poor, unacceptable, disappointing, requires new methods)

Interviews

Table 5.2 Shows questions posed to employees and managers of the Municipality of Maputo City

Table 5.2: Questions posed to employees and managers of the Municipality of Maputo City

	EVALUATION
(1) Effectiveness of current solid waste management	N
(2) Awareness of Municipality's current strategies	U
(3) Awareness of Municipality's future strategies	V
(4) Strategies to be adopted to manage solid waste	N
(5) Implementation to enforce solid waste policies	V
(6) Need for staff training	U

Table 5.3: Perceptions of each focus group

Questions	Group A	Group B	Group C
Perceptions of solid waste management	Unable to manage waste properly.	Unable to manage waste and do the job that was set out for them.	Improved but a lot of work is required.
Suggestions for government	Suggestions were provided, as improvement is still required (see section 5.4.2)	Suggestions were provided, as improvement is still required (see section 5.4.2)	Suggestions were provided, as improvement is still required (see section 5.4.2)
Whether current solid waste methods are benefitting citizens	Not benefitting citizens, as residents of Maputo City are still using old methods of collecting waste. Residents are not satisfied with how the Municipality is dealing with solid waste.	Not benefitting citizens, as residents of Maputo City are still using old methods of collecting waste. Residents of Maputo City are not satisfied with how the Municipality is dealing with solid waste.	Not benefitting citizens, as residents of Maputo City are still using old methods of collecting waste. Residents are not satisfied with how the Municipality is dealing with solid waste.
Community involvement in waste activities	Lack or no community involvement.	Lack or no community involvement.	Lack or no community involvement.
How citizens deal with getting rid of waste	Individuals collect their own waste and place it in containers.	Individuals collect their own waste and place it in containers.	Individuals collect their own waste and place it in containers.

There was a lack of cohesion between managers' and employees' perceptions of solid waste management and those of citizens. With regard to dealing with solid waste, managers and employees were satisfied and confident with the processes and strategies they have been following both at the time of the research and for the future. However, when it came to the citizens of focus groups A, B and C, there was consistency in that there was consensus that there was still a lot that the Municipality needed to do to improve solid waste management. The findings indicated that the Municipality could learn a lot from its citizens, because the residents of Maputo City had a number of suggestions that could help to reduce the amounts of waste produced in the city. Furthermore, their suggestions were important, because they were aware of what was happening outside of the offices of the Municipality of Maputo City. They were the ones who had to deal with the consequences of ineffective solid waste management every day.

Even though managers felt that they were doing a good job, the findings from the evaluation key showed that it was not the case. Overall, in terms of solid waste-management strategies, the ratings showed that considerable planning and considerations were required. This was because the strategies focused largely on policies and the implementation of policies rather on practical methods to tackle solid waste management.

5.5 FINDINGS OF THE RESEARCH

The findings indicated that solid waste management in Maputo City is a serious problem, because the Municipality of Maputo City has failed to manage solid waste effectively. Ineffective solid waste management is not impossible to solve. What is required is the involvement of all spheres of government, residents, associations, the private sector and NGOs. A new way of dealing with solid waste management, such as changing the cultural ways of

residents, should be introduced in areas such as households and neighbourhoods in both rural and urban areas. The appropriate introduction of education programmes in schools and community involvement in all activities pertaining to solid waste management should be undertaken.

As noted, effective solid waste management reduces the impact on the environment and improves the quality of health of human beings, but in order to be effective, basic methods must be applied, such as recycling and waste reduction, which have to be in place so that waste can be eliminated.

From the study, the researcher learnt that solid waste management refers to the supervised handling, treatment, storage and transportation of waste up to the designated dumpsite. Solid waste management is a long process that requires a combination of essential strategies. To be effective, it is crucial that municipalities implement adequate strategies, which include source reduction, reuse and recycling methods.

Both at national and local government levels, budgets, policies and programmes must be carefully designed. When designing these policies, public consultation in the decision-making processes must be undertaken, where citizens share their views and opinions. Although a municipality is responsible for commanding all activities, it is quite clear that municipalities cannot perform all activities on their own. There is a need to work with other institutions in order to minimise waste.

To undertake effective solid waste management, adequate and sufficient financial and other resources are required and these resources have to be managed in a transparent and accountable manner. Staff working in the department of solid waste management need to be qualified and

should have the capability to deal with all matters related to solid waste management, such as implementing and enforcing policies and monitoring and controlling the processes. There is a need for them to be involved in all matters under discussion.

5.6 CHAPTER SUMMARY

This chapter provided the findings from the interviews and focus groups discussions that were used to collect information for the evaluation of solid waste management within the Municipality of Maputo City.

Qualitative methods were used in order to report information and to collect and describe matters related to solid waste management in Maputo City.

CHAPTER 6

RECOMMENDATIONS AND CONCLUSIONS

6.1 INTRODUCTION

This chapter develops a set of recommendations and conclusions for improved solid waste management by the Municipality of Maputo City.

6.2 RECOMMENDATIONS

6.2.1 Recommendation 1

Recommendation 1 is that solid waste should be separated by all households at home where it is produced, and that the Municipality of Maputo City should classify all types of waste according to their characteristics. All households should use different types of bags or containers to separate waste. For example, all households should use black plastic bags in which to place remnants of food, blue plastic bags in which to place bottles and cans and green bags in which to place plastic and paper. These types of bags should be sold in all shops at the lowest price possible to allow everyone to be able to buy and use the bags.

Public institutions and private companies should send all waste that they produce to recycling depots. The Municipality of Maputo City should encourage communities to participate in formal recycling processes and should be able to provide them with loans so that they will be able to initiate recycling processes.

Encouragement of the city dwellers to recycle items such as plastics bags, packaging and other materials when they make purchases should be heightened by the Municipality of Maputo City

through the placement and distribution of pamphlets around the city to all people passing by on the streets. For example, when city dwellers do shopping, they should reuse plastic bags and ice cream bowls in which to place vegetables and other products.

All producers of waste should be educated about the three Rs (reuse, reduce and recycle). This should be propagated by all channels on radio and television.

6.2.2 Recommendation 2

It is imperative that the Municipality of Maputo City run awareness campaigns through different television and radio channels among city dwellers of Maputo City to adopt urban behaviour (e.g. minimisation of household waste, such as placing trash in plastic bags and in containers).

The Municipality of Maputo City should also design pamphlets with slogans and place them everywhere to educate all households on how to treat waste.

6.2.3 Recommendation 3

Each year, the Municipality of Maputo City should be responsible for organising workshops and creates clusters of assessment, bringing together lawyers, environmentalists, academics, government officials, politicians, religious leaders, employees, physicians, economists, civil society, banking businesses, merchants and other units in an effort to study and discuss the cost and benefit of the application of modern methods of treatment of solid waste and to adjust to economic and social development.

6.2.4 Recommendation 4

Containers should be distributed to each family and should be placed strategically across the city by the Municipality of Maputo City, and these containers should be regularly maintained in order to make them durable.

6.2.5 Recommendation 5

It is suggested that the Municipality of Maputo City cooperate with South Africa because this study demonstrated that solid waste management is done in an effective way in South Africa.

6.2.6 Recommendation 6

The radio and television are extremely dominant ways to bring messages to a large mass of the population, so it is recommended that programmes related to solid waste management be exploited to the maximum to help the Municipality of Maputo City to disseminate waste-management programmes to the public.

6.2.7 Recommendation 7

It is recommended that further study be undertaken in this regard and on this important topic.

6.3 CONCLUSION

All people around the world generate a vast amount of waste, which should be given a final destination. The tons of waste come from the remains of food, cans, tins, metals, old clothes, discarded objects, packing and other materials. In the past, many countries used traditional

methods to dump the produced waste. Solid waste-management solutions could be achieved through using modern landfills and incineration.

Developed countries use sanitary landfills as a replacement of old-fashioned methods. The use of modern landfills and incineration is seen as a solution to solid waste management, as it prevents the contamination of soil and groundwater, reduces the amount of waste produced each day, allows the neutralisation of some hazardous waste, and provides the ability to produce electricity.

Solid waste management involves supervising, handling, collecting, administering, treating, transferring and transporting all types of waste up to their final destination.

Effective solid waste management could be achieved through using source reduction (reduce, reuse and recycle). These strategies are important, as they minimise waste and create job opportunities for disadvantaged people. Although these three options are a solution to solid waste management, incineration is the major alternative, because waste can be burnt.

Despite existing options and strategies to solve solid waste-management problems, the Municipality of Maputo City is facing ineffective solid waste management, which is attributed to many factors, including –

- lack of adequate financial and other resources;
- lack of civic culture and education;
- low salaries;
- unqualified and untrained staff;
- incapability of running trucks that are used for transportation of waste from collection points to the dumpsite;

- increased population in the city;
- theft of containers;
- incapacity to use modern technology due to high costs involved; and
- the lack of implementation and enforcement of policies.

To improve solid waste management, the Municipality of Maputo City has involved NGOs, the private sector, associations and individuals in some solid waste-management activities, but the solution has not yet been reached. Few people are participating in formal systems of material recovery. Nevertheless, some people reuse plastics, paper, furniture and cans for domestic purposes and others sell these to small recycling places situated in Hulene. Those who are poor without minimum conditions to survive recycle materials to be able to fight against poverty. Even though some residents demonstrated an interest in participating in the recycling process, they experience limitations due to Maputo City's lack of local markets for recyclable products. There is therefore a need for the Municipality of Maputo City to create conditions so that many people can be involved in the recycling process. This will not only provide jobs for some residents, but will also help to reduce the amount of waste produced in the city.

Although the Municipality of Maputo City has designed a strategic plan, which can be used to relieve the solid waste-management problem, the problem persists due to difficulties in making an assessment and managing the official and illegal dumpsites. The dumpsites do not meet the essential conditions and waste is burned on the official dumpsite with no observation of necessary requirements. In many zones, citizens dump waste in an indiscriminate manner and it has become common to find most residents burning or dumping waste in inappropriate spaces, as the Municipality cannot assume responsibility for the waste generated everywhere.

Master plans and policies both at national and international level exist to cope with large amounts of waste, but these are not effectively implemented and therefore there is a need to change the picture of solid waste management by enforcing and implementing the existing policies. As capacity building is an imperative in running an institution, the Municipality needs to develop capacity building among its employees. To harmonise solid waste management, the Municipality of Maputo City must set up educational programmes and should provide facilities to the private sector, associations and other individuals to participate in various processes of solid waste management.

The improvement of solid waste management could be reached through launching educational programmes in schools where students from Grade 3 to higher education are taught how to deal with waste generated in the home. Similar programmes must be presented to the households. Public awareness campaigns through television and public meetings are also important ways that can assist the Municipality in improving solid waste management.

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Annexure A: Interview Schedule

Interview Schedule

Institution Name:

Position:

Gender:

Academic Achievement:

Date:

Good morning/afternoon. I am Elsa Alberto Pondja Manhica, a student from Cape Peninsula University of Technology, currently doing an MTech in Public Management. I am conducting a survey into Solid Waste Management and would appreciate it if you would help me in answering the following questions:

Q1. Do you think that current solid waste management in Maputo city is effective?

Q1.1 If not comment

Q2. What are the Municipality's current strategies to deal with solid waste management?

Q3. What are the Municipality's future strategies and goals to deal with solid waste management?

Q4. What strategies should be adopted by the Municipality of Maputo to minimize waste produced in the city?

Q5. What should be done to implement and enforce solid waste management policies in the Municipality of Maputo?

Q6. Do you think that there is a need for personnel training in the area of solid waste management?

END OF QUESTIONS

THANK YOU FOR YOUR TIME, PARTICIPATION AND CO-OPERATION.

Annexure B: Focus Group Discussion

Focus groups questions

I, Elsa Manhica, am a registered student for a Masters degree in Technology (Public Management) at Cape Peninsula University of Technology – Faculty of Business.

I am conducting an evaluation of solid waste management in the Municipality of Maputo City, and I am interested in collecting accurate information through your opinions, perceptions and thoughts related to solid waste management, for the conclusion of my studies. Please participate by being involved in group discussions, which will only take one hour.

Q1. What are your perceptions around solid waste management by the Municipality of Maputo?

Q2. What do you suggest that the government should do to improve solid waste management?

Q3. Do you think that the current solid waste management is benefiting every citizen?

Q4. Did commutities ever get involved or participate in solid waste management activities?

Q5. How do communities deal with solid waste produced from homes?

END OF QUESTIONS

THANK YOU FOR YOUR TIME, PARTICIPATION AND CO-OPERATION

Annexure C: Ethical Approval

Cape Peninsula
University of Technology

Cape Peninsula University of Technology
Faculty of Business Research Ethics Committee

Members present:
Prof S Davies, Dr W Ukpere, Prof K Swart, Ms C Steyn, Prof H Ballard,
F Salie (Secretariat)

Venue: Boardroom, Faculty of Business, Cape Town Campus
Date: Friday 09 April 2010

Please note that applications to the Faculty of Business Research Ethics Committee (FBREC) must include a full research proposal (that has been approved by the supervisor) that includes a section on the ethical issues involved in the study; along with necessary supportive documentation.

Student:	Manhica, E 205122051
Supervisor:	Dr R Hendrickse
Level:	MTech
Title:	An evaluation of solid waster management with specific reference to the municipality of Maputo City (Mozambique)

Decision of committee: The Faculty of Business Research Ethics Committee (FBREC) has **approved** the submission and make the recommendation that it be forwarded to Faculty of Business Research Committee (FBRC).

SDavies

Prof S Davies
Chairperson: Faculty of Business Research Ethics Committee
09 April 2010

Annexure D: Editing and Proofreading Certificate

Jackie Viljoen
Language Editor and Translator
16 Bergzicht Gardens
Fijnbos Close
STRAND 7140

Accredited member of the South African Translators' Institute No 1000017
Member of the Professional Editors' Group (PEG)
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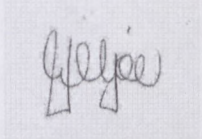
Postal address: 16 Bergzicht Gardens, Fijnbos Close, STRAND 7140 South Africa

DECLARATION

I hereby certify that the MTech thesis of **ELSA ALBERTO PONDJA MANHICA** was properly language edited.

Title of thesis:

A COMPARATIVE STUDY OF SOLID WASTE MANAGEMENT: THE CASE OF THE MUNICIPALITY OF MAPUTO CITY (MOZAMBIQUE)



JACKIE VILJOEN
Strand
South Africa
21 June 2012

Annexure E: Letter of Permission from the Municipality of Maputo Translated into English

MUNICIPALITY OF MAPUTO

MUNICIPAL COUNCIL

DIRECTORY OF THE HUMAN RESOURCES MUNICIPAL SERVICE

To the
University of Technology of the
Cape Peninsula

Maputo

04/11/2009

Illegible figure/GGI/653/DPDRH/2009

Subject Matter: Dispatch Communication

1. By dispatch of His Excellency the President of the Municipal Council dated 30/10/09 we communicate that **Elsa Alberto Pondja Manhiça**, student doing the degree of Masters in Technology (Public Management) was authorized to perform research about "Evaluation of Solid Wastes Management with Specific Reference to The City of Maputo Municipality (Mozambique), at this institution.

2. For the purpose of this said student, this Directory, the Planning Department & Human Resources Development must be contacted regarding any further proceedings.

Yours faithfully

Stamp of the Maputo Council

Municipal Council
General Secretariat
Record no. 3079 /09
Date 04/11/09

ANA PAULA MONTEIRO TAVARES ZOLEZZI
B.I. No 5339078 de 20.06.2003
Emitido pela Direcção Geral dos Registos e do Notariado;
Serviços de Identificação Civil - Lisboa
Tradutora Ajuramentada/Oficial
Pelo Supremo Tribunal da Africa do Sul, na cidade do Cabo/
Cape Town
Reg. No 10224/2004

Annexure F: Letter of Permission from the Municipality of Maputo (Portuguese)

MUNICÍPIO DE MAPUTO

CONSELHO MUNICIPAL

DIRECÇÃO DE SERVIÇO MUNICIPAL DE RECURSOS HUMANOS

À
Universidade Tecnológica da
Península do Cabo

Maputo

_____/SG/653/DPDRH/2009 04/11/2009

Assunto: Comunicação de despacho

1. Comunica-se que por Despacho de **30/10/09**, de S.Excia o Presidente do Conselho Municipal, a senhora **Elsa Alberto Pondja Manhiça**, estudante do curso de Mestrado em Tecnologia (Gestão Pública) foi autorizada a realizar uma pesquisa sobre: "**Avaliação da Gestão de Desperdícios Sólidos com Referência Específica à Municipalidade da Cidade de Maputo (Moçambique)**", nesta instituição.

2. Para o efeito, a referida estudante deverá contactar esta Direcção, Departamento de Planeamento e Desenvolvimento de Recursos Humanos, para procedimentos subsequentes.

Com os melhores cumprimentos.

O Director,

Armando Chivo
(Prof. Mestre Pub.)

Cc/ do Sra. Elsa Alberto Podja Manhiça

LR

CONSELHO MUNICIPAL
Secretaria Geral
Saida n.º 3079/09
Data 04/11/09