WASTE MANAGEMENT IN THE SEDIBENG DISTRICT MUNICIPALITY: A STRATEGY FOR IMPROVED SERVICE DELIVERY

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DECLARATION

I declare that "**WASTE MANAGEMENT AT THE SEDIBENG DISTRICT MUNICIPALITY: A STRATEGY FOR IMPROVED SERVICE DELIVERY**" is my own work and that all the sources I have used or quoted have been duly acknowledged by means of complete references, and that I have not previously submitted the thesis for a degree at another university.

KHATHUTSHELO ELIAS MASINDI

SUMMARY

Waste, that is any matter whether gaseous, liquid or solid or any combination thereof, originating from any residential, commercial or industrial area identified as undesirable or superfluous by-product, emission, residue or remainder of any process or activity tends to be a hazard to the environment. Waste is generated in all processes which transform materials from one state, form or medium to another. The management of waste in the Sedibeng District Municipality is a very complex problem. There are many reasons for this and these include: the diverse and voluminous waste stream; progressive accumulation of waste in the environment; large numbers of unpermitted waste disposal sites; the severe shortage of hazardous waste disposal sites and shortage of personnel in local municipalities qualified to implement existing legislation.

The accumulation of waste in the district not only poses a serious and growing threat to health and quality of life, but also causes infrastructural damage such as the blocking of storm water drains and sewer by litter which ultimately leads to costly road and pavement destruction and increase in maintenance costs.

The objective of the study was to investigate waste management activities in the Sedibeng District Municipality and to explore best practices as strategies for recommendations. The Sedibeng District Municipality comprises three local municipalities namely the Emfuleni, Lesedi and Midvaal Local Municipalities. Due to the fact that the Municipality forms part of the industrial hub of the Gauteng Province, there has been an excessive influx of the people into the district and,

as a result, more houses had to be built and more normal urban services such as electricity, sanitation, water and waste, had to be provided.

The study intended to investigate different waste management strategies that are employed by the three local municipalities that could help reduce the impacts and volumes of waste that are generated by residents before such waste could pollute the environment. A further objective was to explore possible waste reduction mechanisms such as recycling that can help reduce waste volumes before they reach the disposal site.

Arising from the problem statement on waste management for this study, it is important that the *locus* of this study be directed towards the solution of the problem on waste management activities in the Sedibeng District Municipality.

The following hypothesis was accordingly formulated:

> Waste management strategies and practices as currently practised in the Sedibeng District Municipality are obsolete, outdated and inadequate to attain a cleaner environment and as a result, there is a need to explore the development of more cost effective strategies in waste management.

Comparative study of the different strategies that are employed in the three local municipalities as well as the challenges they face when providing the required service, were made. Similar study was applied to the achievements that are recorded as findings of the study. The challenges and success stories highlighted

in the study were found through the use of questionnaires that were distributed to respondents in the three local municipalities. Questionnaires for the study were compiled for both councilors and municipal officials.

The research instruments for the study included questionnaires, interviews and consultations with members of the community. Further technique was participant observation, the researcher being responsible for the provision of refuse removal services to the Evaton and Sebokeng communities.

Amongst others, it was found that: discrepancies existed in the waste management processes and these include the following:

- There was a serious problem of personnel shortage in municipalities as a result of financial constraints that led to non-replacement of personnel who went on retirement, resigned or died;

- Existing equipment do not compliment the growing population figures as well as the sizes of the municipality and as a result, residents opted to dump waste at their backyards as an alternative procedure for disposal of waste from their homes, and

- Problems attributed to illegal dumping increase each day and their resolution will be a function of implementation of compliance with legislation.

- Community awareness of refuse collection schedule is at minimum, a situation which leads to illegal dumping of waste, and

- Tariff on refuse removal is deemed to be prohibitive to African residential areas.

The study ends with recommendations for management action on waste, and for further research.

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INTRODUCTION: PROBLEM STATEMENT AND RESEARCH OUTLINE

1.1 INTRODUCTION

The purpose of this chapter is to provide an introduction and an overview on waste management practices in the Sedibeng District Municipality and this serves as a frame reference for the research. The study focuses on how these functions are practised in the three local municipalities falling under this district. The study further presents the problem statement, research questions, objectives, a hypothesis, motivation for the research and research methodology.

1.2 ORIENTATION AND PROBLEM STATEMENT

The theory of solid waste management in a country is to bring about control to waste generation, prevention, minimization and disposal in order to ensure that public health and occupational health issues receive due consideration in all waste management practices as provided for in Section 24 of the Constitution of the Republic of South Africa, Act 108 of 1996. This stipulates that all people within the country have got the right to a healthy environment which is protected for present and future generation from ecological degradation. The Constitution further presents an overarching obligation to sustainable environmental management which calls for municipalities to provide services in a sustainable manner, provide a safe and healthy environment for all communities, promote

social and economic development and ensure transparent governance (Kidd 1997:34.)

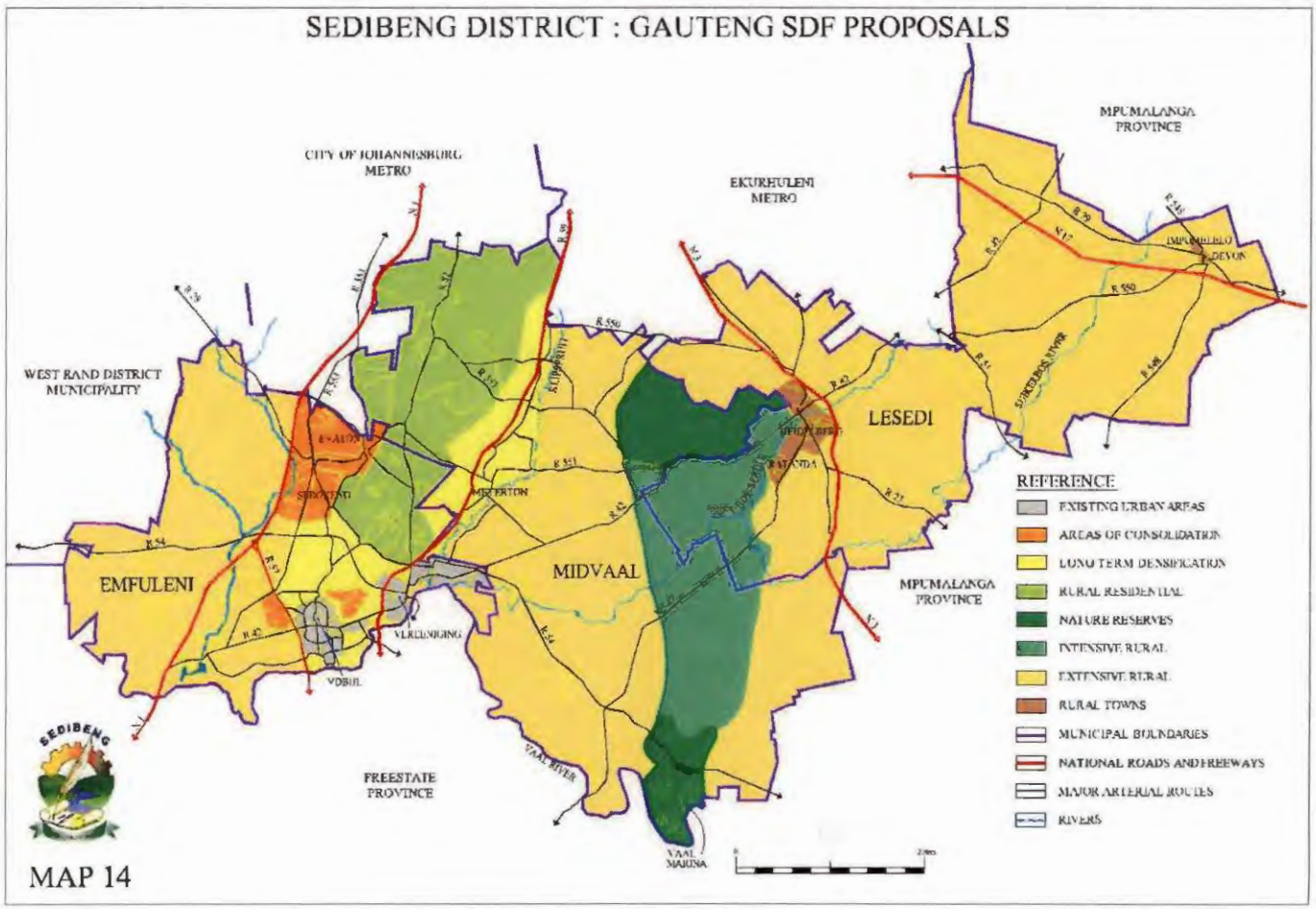
The problem of waste management at the Sedibeng District Municipality will continue to pose an increasing threat to human and environmental health unless proper measures to monitor and control the generation and the disposal of waste are enacted and implemented. Rapid population growth, accompanied by urbanization and industrialisation, has resulted in a dramatic increase in the volume of waste generated. Urban waste, which originates mostly from industrial activities amounts to 10 884 tons per annum and 80 084 tons from different households and, they contribute much to environmental pollution in the Sedibeng District (Mkaza 2003:01). Waste is mostly associated with household refuse and littering. Littering, which is a common occurrence in built up areas, occurs when people throw trash directly into the streets as well as on public open spaces.

According to Leitch (1995:8) the essence of waste management is the upfront and proactive prevention of pollution and, in terms of this phenomenon, the purpose of waste management is to anticipate waste production, and to understand its consequences and to implement necessary steps to reduce the net impact of its production to acceptable limits. Local Municipalities are compelled to adopt more expensive waste management strategies to prevent possible environmental pollution as the problem of waste seem to increase each day. Problems attributed to poor waste management strategies employed by local municipalities, that is, Emfuleni, Lesedi and Midvaal Local Municipalities engulf the Sedibeng District Municipality as quantities of waste generated increase at an alarming rate. As many young people flock to the cities in search for work, solid waste

generation increases and, as a result, several developing new areas through this movement, experience serious waste disposal problem. In that context, waste can be defined as any undesirable or superfluous by-product or residue of any process or activity, which can either be in a liquid or solid form that has been discarded by any person with the purpose of eventually discarding it (Minimum Requirements 1998).

The Sedibeng District Municipality is situated on the southern side of the Gauteng Province and borders the Free State province. Its layout is as follows:

Figure 1.1 Sedibeng Map



In terms of the above map, the Sedibeng District Municipality was established in line with the provisions of the Gauteng Provincial Gazette No 141 of October 2000 which stipulated that boundaries of the Sedibeng District Municipality should cover areas around Lesedi Local Municipality (formerly known as Heidelberg) and the Midvaal Local Municipality (formerly known as Meyerton) on the north, and to the south where Emfuleni Local Municipality is situated. The Emfuleni Local Municipality is made out of a number of towns and townships and these include Vereeniging, Vanderbijlpark, Sebokeng, Evaton and Vaaloewer areas. The Lesedi Local Municipality comprises areas such as Heidelberg, Nigel, Balfour and Devon while the Midvaal Local Municipality comprises towns such as Meyerton, Randvaal, Daleside, De Deur and Walkerville. The size of the district covers an area of about 4630 km² and has a population of about 1,408,000 people with a total number of 191,729 formal households (Mkaza 2003:01).

Taking into account the effects of the industrialization process in the Sedibeng District, many industries are relocating into the area due to availability of cheap land and some sufficient infrastructure developments. According to Wiechers, Borland and Matsabu (2002:341), despite the increasing recycling activities, the quantity of waste that is generated is rising because the generation of waste has not been specifically targeted. Furthermore, South Africa is facing limited disposal capacity and limited land available for new landfill development, as well as serious health impacts as a result of illegal dumping. Similarly, the recent closure of the Zuurfontein landfill site at the Vanderbijlpark area in 2005, has exacerbated the matter as the available landfill airspace is reaching a critical state of short supply and it is becoming more expensive to re-route new waste to far away disposal sites such as Waldrift landfill site in Vereeniging and Boitshepi landfill site in the

Boipatong area, by municipalities. Currently, the cost to manage solid waste at the Sedibeng District Municipality has been shown to increase tremendously within the district reaching a total amount of R22.1 millions in a year (Ball 2005:10).

Considering the state of solid waste management within the Sedibeng District Municipality as interpreted in line with the provisions of the Minimum Requirement (SA:1998) the ambiguity of the term waste and waste management has led to Molao-Chikanda and Tebele (2002:386) to view the term waste management as referring to the proper handling, collection, storage, transport, treatment and disposal of waste during all the stages of production, storage, storage, transport, processing, consumption and delivery of goods and services. The current rate of urbanization at the Sedibeng District has led to the establishment of a variety of informal settlements such as Sicelo in Meyerton Phumasibethane *alias* Lybia in Sharpeville near Vereeniging and Sonderwater informal settlements near Beverly Hills in Evaton. Most of these areas have no proper infrastructure conducive to sustainable household refuse collection. Household refuse collection is one of the major municipal functions that is found in urban areas and is confined to areas where proper infrastructure such as road networks, had been developed while no proper house-to-house refuse removal service is rendered in informal settlements. This situation has therefore, resulted in the emergence of heaps of stinking dumps, uncollected waste, or waste disposed of by roadsides, on public open spaces and in storm water drainage pipes. According to Younge (1999:51) urban development patterns have segregated the population on the basis of race and income, and many of the costs of urban inefficiency are borne by the lower-income groups. The poor are typically located in furthest areas where local government structures have inequitable

access to revenue sources that result in massive service disparities and services such as housing, water, waste removal and electricity.

Local municipalities have a constitutional obligation to ensure that all residents within their boundaries must stay in an environment that is not harmful to their health. In terms of Section 24 of the Constitution of the Republic of South Africa (1996), every citizen is guaranteed the right to a healthy environment, and to have the environment protected for the benefit of present and of future generations. In other words, a healthy waste management system is a *sine qua* non for the sustainable development of South Africa. This laudable constitutional provision is to be implemented through reasonable legislative and other measures that will prevent pollution and environmental degradation thereby promoting conservation, securing ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Noting the current and turbulent status of waste management at the Sedibeng District, one becomes doubtful whether all guarantees spelt out in the Constitution are ever going to be realized as read in line with provisions of Minimum Requirements for Waste Disposal as published by the Department of Water Affairs and Forestry (DWAF) (1998:02) which yearns for a cleaner environment and to ensure the following:

- to improve the standard of waste disposal in South Africa;

- to provide guidelines for environmentally acceptable waste disposal for a spectrum of landfill sizes and types; and

- to provide a framework of minimum waste disposal standards within which to work and upon which to build.

The yearning for a cleaner environment however, leads to a huge backlog in the provision of a sustainable refuse removal service. Most of the backlog in the provision of a specific service, for example, weekly household refuse and illegal dumps, are found mostly in formerly disadvantaged areas partly due to problems related to non existence of roads and to non-payment of services (Macdonald & Palmer 1996:271). Despite all the above, municipalities are always expected to render a normal house to house refuse removal service, yet, service delivery is a function of availability of money which may deplete if much of it is spent on waste collection. Barclay and Buckley (2001:9) came up with a proposal that there is a need for service providers to introduce new strategies which must be put in place that can lead to the reduction of waste from all sources. Furthermore, the authors reckon that waste minimization is a set of procedures that any institution can implement to identify all sources of waste and to work towards reducing or eliminating these types of waste before they occur.

Managers and practitioners in the waste management fraternity currently face a problem of the emergence of large quantities of waste that are ever increasing, and while two thirds of waste generated is land filled, waste recycling rates have shown a rather limited increase over recent years. The level of refuse removal services at the Sedibeng District Municipality has deteriorated due to the shortage of equipment such as compactors and personnel. Informal settlements as well as planned housing developments are coming up

at such a fast rate that municipalities have become hard pressed to provide effective service to all of them. In some other areas, especially in newly constructed houses mainly in formerly disadvantaged areas, access roads do not exist and they are usually constructed once the area is fully occupied while in some other areas, existing roads are too narrow and deny double axles refuse removal compactors to move into the area.

Realizing the impact of population increase as well as the increasing number of new housing developments, Nguta (1996:356) warned that the current status of waste management schemes and practices are obsolete, outdated and are no longer adequate as they were designed for smaller towns with fewer houses and lesser population, therefore, the emergence of waste management related problems should always be anticipated. It may be noted that waste disposal methods practised by residents at the Sedibeng District Municipality, range from dumping in ravines, on abandoned pieces of land, on public open spaces and in rivers, to incineration and sanitary landfill. The latter are more acceptable because all collected waste is each day buried beneath a layer of earth or covered with soil.

Given the current rate of urbanization, new and better waste management strategies must be introduced for the Sedibeng District Municipality. Contrary to waste management activities that involve burying of waste, waste minimization that is aimed at reducing waste, seems to be the solution. Waste minimization is seen as one of the strategies that can help municipalities to reduce volumes of waste within their areas of jurisdiction, prevent waste from entering the environment as well as reaching a respective landfill site. Waste minimization is different, yet is part of waste management. Law (1996:102)

explains waste minimization as in-plant practices that reduce, avoid, or eliminate the generation so as to reduce the pollution risk to health and environment.

There is a need for this study to be done in order to research different waste management strategies that can be useful and that will ensure that Sedibeng District Municipality is going to benefit something from them after implementation. As municipalities are not profit oriented, adopting the private business` strategies in order to sustain their financial stability, will result in more hardship for poor people within their areas of jurisdiction. Running away from the above profit making idea, municipalities must try to utilize their available resources to boost their revenue through cost-effective mechanisms such as more effective and efficient waste management strategies.

1.3 IMPORTANCE AND RELEVANCE OF THE STUDY

Too much waste is currently generated within the Sedibeng District and at times, some of the waste generated is not collected on scheduled days due to a number of reasons which include factors such as non-cooperation by some community members who take out their refuse bags immediately after seeing the municipality waste passing their houses. Municipalities are custodians of landfill sites and are responsible for their management and maintenance and therefore, if landfill sites are properly managed, funds generated during the disposal of waste by different users, will form part of their income. Some waste seen strewn along main roads, is mainly from individuals who run away from paying a fee at the disposal site and as a result, an affected municipality will be losing both the disposal fee as well as the money to clean the affected area.

In a study conducted by the Ekurhuleni Metropolitan Council, it was established that landfill sites generate methane gas during the waste decomposition process and as a result a greenhouse gas problem is produced that can contribute to global warming and can lead to climate change. The extraction of this gas from landfill sites brought positive results for the council as its municipal vehicle fleet, were converted from using diesel and petrol into Methane gas thereby leading to the reduction of high fuel bills that were initially incurred. Further, the Methane gas can be sold to other users or be used to produce heat for both domestic and industrial applications such as kilns that have a high demand for heat (Daroll 2003:36).

Similar studies, in line with the Cities for Climate Protection (CCP) programme of the International Council for Local government (Iclei), were conducted for the Potchefstroom City Council in 2001 in order to reduce the greenhouse gas emissions. The objective of the programme was to ensure that the city council recovers methane gas from the sewage works to curtail methane gas emission into the atmosphere. The required energy source was used to incinerate solid screening from inlet works as this incinerator was previously fired by diesel. The usage of the Methane gas helped the council to reduce fuel bills that were incurred before and also enable the council to attain a cleaner environment (Nel et al 2003:27).

Recently, the World Bank through Dr. Crispian Olver commissioned a study on 28 May 2007 in 10 existing and closed landfill sites around the Sedibeng District Municipality and to make a thorough analysis on the level of Methane gas or Carbon credits produced in

these areas. The purpose of the study is based on the report issued by the Department of Environmental Affairs and Tourism in 2004 wherein it was reported that methane emissions from landfill sites and wastewater treatment facilities, contribute approximately 33% of the total methane emissions. The Sedibeng District Municipality is unfortunately situated on the low lying side of the province and the sewer outflow of Johannesburg and its areas, contribute much to high sewer volumes, hence, the percentage mentioned by the department. In pursuance of the above, a report to that effect has already been submitted to the municipality for approval (Olver 2007:5.)

According to Poswa (2000:670) the financial status of various municipalities is not good and as a result, much of the highly needed basic municipal services cannot be fully rendered. This has led to an outcry from communities who advocate for total privatization of all solid waste management services on the grounds that there is lack of commitment by local municipalities that is accompanied by poor management and inadequate supervision of staff. Assessing the level of service payment around the Sedibeng District, which is quite nominal, one becomes doubtful whether the above thinking can be realized. Further, if the abovementioned outcry can be adopted based on the current poor level of service payment, how will contracted service providers be paid for the services rendered? Who is going to force residents to pay for services rendered to them? Cost-control mechanisms, such as waste management, waste recycling, waste minimization and waste Re-use, need to be explored to obviate the financial constraints within municipalities.

In contrast to the above opinion, du Plooy (1994:20) stated that there is an urgent need

for services such as solid waste removal, sanitation and electricity. The communities are willing to pay for such services provided that such services must be of higher standard and that, municipalities are expected to install them first before payment commences. In newly developed areas, especially in formerly disadvantaged areas where houses are built without considering the issue of constructing road network, how will services such as house-to-house refuse removal services be rendered?

1.4 MOTIVATION

This study is premised on the analysis of various waste management strategies by the Sedibeng District to ensure effective Waste Management that can be employed to bring about cost reduction in the management of waste. Basically, the aim of this study, is to suggest strategies and measures that could assist to halt and or to reverse the effects of environmental degradation in the contexts of increased national and local efforts to promote sustainable and environmentally sound developments. Some of those strategies that can be looked into in order to ensure effective and sustainable waste management can include the following:

- To develop a strategy that will address methods on waste management to achieve compliance with the requirements of the waste management legislation;

- To involve local communities in the compilation of strategies and methods to be utilized to ensure that environmental conditions are not affected adversely as a result of poor waste management methods;

- To identify and develop a plan for future waste management needs and requirements that provides short-, medium- and long-term planning strategies;

- Separation of waste at source; a new strategy that will help to determine the type of waste that will be recycled and those meant for the landfill site as well as waste minimization;

- Composting of organic material, a move that will benefit municipalities financially after the sale of the product;

- Environmental education which entails the transfer of knowledge on environment to people;

- Polluter-pays principle, a concept used to pin down offenders to become responsible for the rectification of the wrongs committed;

- Environmental liability whereby polluters will be held responsible for the rehabilitation of any of the affected areas that can be identified;

- Extended product responsibility (EPR) whereby manufacturers become responsible for their obsolete products;

- Introduction of Municipal Service Partnership with private service providers;

- Formation of waste management unit with private service providers; and

- To conduct regular auditing and environmental monitoring in order to maintain standards of operation and to limit the impacts of waste disposal activities on the environment.

1.5 RESEARCH QUESTIONS

Based on the contents of the orientation and problem statement that have been outlined above, the following research questions and objectives can be postulated:

- What is waste and waste management?

- What is waste minimization?

- What is Integrated waste management plan?

- What can be done to ensure that volumes of waste are reduced before waste generated could reach any of the disposal sites within the Sedibeng District Municipality?

- What are the sources of waste and what remedies can be employed to inhibit waste generation within Sedibeng District Municipality?

- Are there any cost saving mechanisms that can be applied to minimize the financial burden currently experienced by Sedibeng District Municipality?

- Are there any other strategies that can be brought into this study that can add value to curb the waste increase trend before it becomes a nuisance?

- How can communities become involved in the management of waste within the Sedibeng District Municipality?

- Who is responsible for the maintenance of existing landfill sites?

- What benefits currently accrue to the Sedibeng District Municipality when running these waste disposal sites? and

- Are existing standards within waste disposal sites in line with legal specification and if not, how can the situation be remedied?

1.6 RESEARCH OBJECTIVES

- To provide a theoretical exposition of concepts waste and waste management,

- To investigate and identify better strategies that can be utilized to reduce volumes of waste before they reach waste disposal sites,

- To identify sources of waste and to record activities and residue of all operating industries within the Sedibeng District,

- To research and recommend the implementation of cost saving strategies that can be adopted by the Sedibeng District Municipality to ensure a sustainable household service delivery within the area of its jurisdiction,

- To recommend measures that will help promote environmental education, training, research and the dissemination of information to all people in matters relating to waste management,

- To recommend ways and means that can be adopted by the municipality in their fight against environmental pollution by irresponsible polluters as practised in other municipalities including European countries experiencing similar problems through research, and

- To bring in new researched knowledge to the waste management field that has been compiled through the interaction with different municipal officials during the implementation of proposed and planned practices that could bring waste management problem under control.

1.7 HYPOTHESIS

The following hypothesis is stated as operational for the thesis:

Waste management strategies and practices as currently practiced in the Sedibeng District Municipality are obsolete, outdated and in adequate to attain a cleaner environment and as a result, there is a need to explore the development of more cost effective strategies in waste management.

1.8 RESEARCH METHODS

The study comprises a literature study and empirical methodology.

1.8.1 Literature Study

Information to be used for the study were acquired from the municipality reports and policies, legislation, Government publications on integrated waste management, periodicals, newspaper reports and books.

The main documents studied in the analysis were:

- Atmospheric Pollution Act (1965)
- The Constitution of the Republic of South Africa Act (1996)
- Environment Conservation Act (1989)

- Environmental Management: Waste Management Bill (2006)
- Hazardous Substance Act (1973)
- Health Act (1977)
- Government Gazette Notice 1096 (1997)
- The Local Government Municipal Systems Act (2000)
- Mineral Act (1991)
- Minimum Requirements – Waste Disposal (1998)
- National Environment Management Act (1998)
- The National Water Act (1998)
- Nuclear Energy Act (1982)
- Water services Act (1997)
- White Paper on Local Government (1998)
- Waste Management Act (2008)

The following databases were also consulted:

- EBSCO: Academic Search File
- Sabinet
- Dialog, and
- Nexus.

1.8.2 Empirical Study

The study is quantitative, descriptive, and analytical in nature and the following research

instruments were used to collect data:

Questionnaire

A questionnaire, which comprises open-ended and close-ended questions, was distributed amongst officials responsible for waste management in respective municipalities namely:

- The Sedibeng District Municipality – Member of the Mayoral Committee (MMC) for Waste Management and Environment, Strategic Manager Waste and Environment, Manager, 3 Assistant Managers

- Emfuleni Local Municipality – MMC responsible for Waste and Cemeteries, Deputy Municipal Manager Service Delivery, Manager: Solid Waste, 3 Assistant Managers, 6 Superintendents (3 depots), 6 Waste management Supervisors

- Lesedi Local Municipality – MMC for Waste and Environment, Executive Director: Waste, Manager, 1 Assistant Manager, 1 Superintendent, 2 Supervisors

- Midvaal Local Municipality – MMC for Waste and Environment, Executive Director: Waste and Environment, 1 Assistant Manager: Waste, 1 Superintendent, 2 Supervisors.

- Gauteng Department of Agriculture, Conservation and Environment (GDACE):

Waste management official;

- National Department of Environment, Agriculture and Tourism (DEAT): Waste management official;

- Metsi- maholo Local Municipality: Waste management officials, and

- Ngwathe District Municipality: Waste management officials.

Furthermore, the researcher conducted interviews with 33 councillors who are involved in waste management related activities within the Sedibeng District especially all those that currently participate in the Bontle Ke Botho Clean and Green competition that is currently run by the Gauteng Department of Agriculture, Conservation and Environment (GDACE) in an attempt to engage all stakeholders, that is, all members of the community to become involved in keeping their surroundings clean. Consultations with Environmental committees established within wards and inline with the provisions of the Local Government Act 117 of 1998, which propagated for the establishment of these structures to become guard dogs of the environment within different wards, were done. Concerned, interested and affected groups that include Non-Governmental Organizations (NGO) are in existence within the wards their inputs into the subject matter formed part of the questionnaire.

Participant observation was also be used as a data-collection instrument. The author of this study is currently an Assistant Manager, responsible for waste management attached

to the Waste Management Division of the Emfuleni Local municipality since 2001. Further, much of the information used in this study is supported by some maps and photographs taken during problem investigation as well as during the performance of scheduled waste management routine duties undertaken by the municipality.

1.9 Outline of Chapters

Chapter outline for the study is as follows:

Chapter 1 Introduction: Problem statement and research methods.

Chapter 2 Theoretical exposition of the concept waste and waste management

Chapter 3 Waste classification, handling and disposal techniques in the Sedibeng District Municipality

Chapter 4 Empirical study on waste management practices at Sedibeng District Municipality

Chapter 5 Summary, Findings, Recommendations and Conclusion.

CHAPTER 2

THEORETICAL EXPOSITION OF THE CONCEPTS WASTE AND WASTE MANAGEMENT

2.1 INTRODUCTION

The quantity of waste in the Sedibeng District is considered to be growing each day as a result of increases in the country` population, increases in industrial activities and the rising living standards. The Sedibeng District Municipality faces a problem of shortage of adequate waste disposal sites as the impact of the population increase gradually takes a greater toll because by the moment communities produce more waste; it automatically reduces the available airspace or land for disposal (Ehrlich & Ehrlich 1972:159).

The chapter attempts to outline the meaning of concepts waste and waste management as interpreted in different institutions especially municipalities to ensure that they bring forth better knowledge to practitioners to improve their performance.

2.2 DEFINITION OF CONCEPTS

The concepts waste and waste management activities around the Sedibeng District Municipality are more complex and they require one to have a clear objective of what one wants to achieve. It is important for one to know that different communities and cultures generate different types of waste. It may be noted that the type of waste generated in a

municipality helps municipalities to determine the type of service that will be suitable for an area. Trends indicate that waste generated by poor communities differs from waste generated by rich communities. According to Meyer (2006:38) it was established that income and waste generation increase at the same rate, be it sewerage, washing water and in suburban pavements where an increased number of refuse bags waiting for collection is found. Provisions of the Environment Conservation Act (Act 73 of 1989) explain waste as a by-product of certain processes that needs to be discarded. The Sedibeng District Municipality is in an industrial hub of the Gauteng Province where a series of products are manufactured. It can happen that during such processes, by-products or residue might come into contact with pollutants that pollute the environment at the end. For the purpose of this study, waste and waste management can be analyzed in the section that follows:

2.2.1 Meaning of the Concept Waste

In terms of the National Waste Management Strategy (1997:17) that was adopted by the South African Government, waste is defined as an undesirable or superfluous by-product, emission, or residue of any process or activity that has been discarded, accumulated or has been stored for the purpose of discarding or processing. Further, waste products may be gaseous, liquid or solid or any combination thereof and may originate from domestic, commercial or industrial activities that include sewer sludge, radio-active waste, building rubble as well as mining, metallurgical and power generation waste.

According to Kidd (1997:121) waste can be defined as what we do not want or what we fail to use with the proviso that "failure to use" include failure to use for its proper purpose. In other words, any item or product that can be of no value to an individual can be disposed of as waste.

While acknowledging the fact that the earth has an ever-growing volume of sewerage and solid waste to dispose of, and the fact that its quantities could increase four to fivefold by the year 2025, Palmer (1998:50) mentioned that solid waste include garbage, refuse and sludge as well as solids and liquids from industrial, commercial, mining, agricultural and community activities.

Similarly, Otieno and Venter (2004: 204) see the concept waste as referring to waste that has been generated from different households especially from the low income areas as well as street sweeping and litter generated in these areas. While it is not correct to reject a definition out of context, authors used a narrow view to explain only what comes from the low income category houses whereas waste is also generated from high income category houses.

Similarly, Purdom and Anderson (1983:358) regard the term waste as bearing the same meaning with the term solid waste. The rationale behind their argument was based on the decision taken by United States Congress through the Resource Conservation and Recovery Act of 1976 where they defined solid waste as any garbage, refuse, sludge from a waste treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid or contains gaseous material resulting from industrial,

commercial and agricultural operations. The authors further argue that refuse and solid waste are just about the same thing while garbage is seen as wasted food with trash and rubbish as roughly equivalent terms that contain little or no garbage.

Depending on the status of an individual, the meaning of waste might radically differ from its real context because it will be found that the nature, quality and looks of the product or item that has been classified as "waste" by well-to-do individuals will be seen as "gold" to the needy or poor ones. In an Environmental Data Report (1993:329) that was adopted by the Unitec Nations, it was highlighted that various forms of waste take on a new economic trend and not only in terms of revenues that can be generated by the waste treatment and disposal industries, but also because some forms of waste may have a residual value as secondary raw material which can be recovered or re-used. In other words, goods of a higher value which include items such as furniture, clothes, glass and metal products, may be disposed by different members of the community and to be collected by waste reclaimers.

According to Kocasoy (2000:639) solid waste is a heterogeneous material including organic waste such as food remains, recyclable materials like paper, plastics, glass, leather, textile and industrial waste. The Sedibeng District Municipality on the other hand, encourages members of its community to recycle all recyclable products before and after being deposited in all landfill sites that are currently operational as a strategy to reduce the waste volume to be landfilled as well as to curb scourge of unemployment and job creation. To augment this, Buy-Back centers for buying all recycled products had to be established around the entire district. The rationale behind the move is to ensure that

waste reclaimers, as they are currently called, do not travel longer distances with such heavy loads of waste to the buy-back center where they will be able to sell their yields (Atkinson et al 1999:75).

In all statements and explanations given above, waste is seen as mainly emanating from activities that are performed in industries in the process of manufacturing goods. Authors such as Andrew and Jackson (1996:324) however do not fully agree with the idea that waste is a by-product of industrial activity. To them, waste is any movable material that is perceived to be of no further use for an individual that must be permanently discarded. The authors further reckon that waste can be a result of illegal dumping activity by an individual, windblown papers as well as fallen items from delivery vehicles.

It is notable that various authors contributed much to the debate around the real meaning of the concept waste. Surprisingly, all definitions bear almost the same meaning and it is difficult for one to reject any one of them as not presenting the real meaning of the term. In view of the above, Poswa (2000:106) concluded that waste is not a neutral concept but should be understood within the cultural context realizing that within the same society, same household, men and women and children may have differing perceptions and views about what is regarded as waste. The author further states that for this reason it is essential to define what constitutes waste that could be put out for collection with the ultimate aim of final disposal in a responsible manner.

2.2.2. Meaning of the concept Waste Management

Waste management can be referred to as a process that can be employed to ensure the safe disposal or recovery of wastes that have been generated to address the root cause of the problem by attempting to change the unsustainable patterns of production and consumption (Kidd 1997:123). The problem of solid waste generation increases with population and technology. According to Raj (2000:69) the quantities of solid waste generated in a country as a whole, increase because of the rapid growth in urbanization process as well as the population explosion in the country, increased economic development, rising living standards and the relative demand for products packaged in non-biodegradable material such as plastic. Similarly, Fuggle and Rabie (1992:493) concur and add that waste management has become one of the more developing multi disciplinary applied sciences that offer practical, effective and often innovative solution to modern waste related problems that currently pollute the environment.

Miller (1994:513) on the other hand regard waste management as a throwaway or high waste approach that encourages waste production and then attempts to manage the ways that will reduce environmental harm by means of burying or burning them. In other words, waste management can be seen as a process that needs to be adopted by the Sedibeng District Municipality that can become useful in the removal for disposal, all unwanted products in a given environment.

Waste management is actually a reactive process or action that is employed to address all waste related problems that can be identified as a result of littering or industrial

residue. In other words, waste management is a belated plan of action aimed at the handling of any identified waste from its generation till its disposal. In terms of the provisions of the Minimum Requirements for Landfilling (1998:2), by adopting the Integrated Waste Management approach (to be explained in the following section) waste management can be planned in advance because the nature, composition and quantities of it can be predicted. In situations such as these, one may doubt whether such prediction is possible.

Waste management is actually a mechanism or a process that should be adopted by municipalities to ensure that waste that has been generated, should be managed in such a way that its side effect becomes less effective. Leitch (1995:8) gave an explanation that the essence of waste management is the upfront, proactive prevention of pollution that could occur accidentally in industries during the manufacturing of products. In other words for waste management to become effective, there should be waste created first or anticipated and thereafter steps to ensure its cleaning, will follow as a solution to the problem identified.

Waste management as undertaken by all municipalities around the country, seek to address the need identified by provisions of the Bill of Rights as contained in the Constitution of the Republic of South Africa which guarantees every citizen the right to an environment that is not harmful to their health or well-being, and to have the environment protected, for the benefit of present and future generation through reasonable measures that will prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting

justifiable economic and sound social development. In order for municipalities to realize this constitutional obligation, a series of challenges and obstacles would have to be faced with, as different types of wastes would require different types of equipment for their disposal.

In the early years of industrial development, waste material was, according to Chukwu (2000:368), either dumped on land or released into water in case of sewage or air principally because of the low concentrations of the chemical content in such waste and the relative purity of the environment. As a result, the polluted air or water cleaned themselves up. The author further stated that it must be noted that in early days, the concept waste management simply referred to dilute and disperse approach which was short-lived due to the magnitude of new chemicals that entered the environment through industrial development.

In order for the Sedibeng District Municipality to uphold its constitutional obligation of attaining a cleaner environment as stipulated by provisions of Section 24 of Act 108 of 1996, advance planning which should be taken in line with the provisions of the Minimum Requirements for Landfilling (1998:2) needs to be done as waste management is a process that must be properly followed and must include aspects such as discussed below:

2.2.2.1 Waste Prevention and Minimization

The concept waste prevention is ambiguous to analyze as it entails the curbing of the production of waste before they occur. As waste products often pollute the environment because they are of no more use to the user, Kidd (1997:121) mentioned that even though waste and pollution are regarded as synonymous, pollution is not necessarily caused by waste and that total elimination or prevention of pollution will as well eliminate modern civilization effectively.

According to Barclay and Buckley (2002:407), the concept waste minimization can be defined as the application of a systematic approach of reducing the generation of waste at source. This applies to all emissions to air, water or land, utility consumption materials used directly in products or services and materials used indirectly in operations. This definition further raises serious concerns about pollution to the environment taking into consideration, the number of industries established in the Sedibeng District and the indicators that need to be adopted to ensure that the threats that can emerge, can be averted without an outcry. All governmental publications related to waste yearn for the minimization of pollution to the environment and the volume of manufacturing industries in the district renders the plans useless. In terms of the State of Environmental Report (2004:3) compiled for the district, the Sedibeng District Municipality is fully aware of the industrialization problem together with its effects, as well as pollution problem which is particularly a matter of concern in issues that include:

- The brown skies in the Emfuleni Local municipality area – characteristics of gases and particulates emitted by a number of industries,

- Land and underground water in areas surrounding Mittal have been subjected to pollution for years due to activities at Mittal,

- Air pollution in the Midvaal emanates from the mining belt in Johannesburg, industries from Johannesburg and also Ekurhuleni. A further source of air pollution is from coal burning originating from a number of townships;

- Pollution of underground water due to illegal dumping of waste throughout the District, and

- Waste spillages especially sewage into both Vaal and Kliprivier rivers.

Ehrlich and Ehrlich (1972:159) share the same sentiments with the above opinion and they further mention that the United States of America is seriously facing solid waste problems due to the emergence of issues such as the non-availability of adequate waste disposal areas which is further caused by uncontrolled illegal dumping activities currently taking place as currently experienced around the Sedibeng District Municipality. The authors further state that due to the magnitude of the waste produced in the area, it is becoming universally recognized that the current methods in use in the management of waste solid waste problems are utterly inadequate.

In support of the above, Breden-Lann (1996:49) mentioned that the current waste management practices in South Africa, allows uninhibited waste production and primarily focus on the correct treatment and disposal. He further stated that this reactive action is not good enough and therefore, there is a need for the introduction of new programmes that must be put into practice that will ensure that waste prevention really does take place. In other words, these actions will require the exploring of new approaches that will not create the wastes in the first place as well as avoidance of the use of toxic material in production processes.

The notion of waste minimization seeks to address the issue of increased waste generation as a result of increasing pressure on waste management resources such as landfill sites, elongated times during collection services and a possible pollution to the environment. In order to avert this, it will make sense for industries including people to reduce the amount of waste they generate hence, the introduction of disposal fee that must be paid by the users for the management of their waste at current or operational landfill sites as well as the issuing of spot fines to offenders (SA 1998:15).

In Sri Lanka for example, the idea of cleaning up an area at the end of the production cycle became a redundancy approach as the concept of preventative waste management and its proper control was gradually gaining ground. Atkinson et al (1999:169) reckon that by reducing waste generation at site or source, it will certainly involve controlling the transportation of all unnecessary materials to the city markets by traders, and also to encourage daily commuters to the city not to take along non-degradable food wrappers and throw them away in the city, thereby minimizing the wastage of both prepared and

unprepared food at home and separating out all reusable and recyclable materials like bottles, metal and plastics.

Similarly, the German government enacted packaging a law in 1991 wherein they intended to reduce the amount of waste being landfilled or incinerated and also to reduce the volume of waste generated in general. To them, the packaging material acceptable must be 65% recyclable so as to attract waste reclaimers to see waste collection as a source of life. These efforts of trying to curb packaging problem went to an extent where the government had to introduce sliding fee whereby manufacturers were charged more for plastic and composite packaging than for glass and cardboard packaging. The rationale behind this idea of introducing these fees and charges for packages, was to encourage German manufacturers to learn how to reduce the volume of waste produced that would have a negative impact on their environment (Miller 2000:592).

With the current rate of urbanization in South Africa, agricultural products in major supermarkets are found wrapped in transparent plastics in order to prolong their lifespan. To a layman on the street, their purchase, will guarantee clean and quality food stuffs. Yet, eventually, all wrappers removed from such foods will be found strewn all over the area in an uncontrolled manner. The above mentioned objective of using plastic wrappers tend to defeat the environmental conservation notion as more and more plastics are thrown all over after being blown around by winds. The question that needs to be asked is how will such a problem be solved? Is the agricultural fraternity not going to be affected negatively if plastic wrappers are to be removed if they may be required to change their packaging patterns by the government? (Fellman et al.1997:480).

Similarly, other authors in the waste management field have seen the need for the reduction of waste volumes as an action that will bring about some advantages or some spin-offs towards the maintenance and protection of the environment. According to Freeman (1995:16) there is a need for the adoption of waste preventative measures as well as the minimization strategies suitable for the Sedibeng District in an attempt to reduce waste volumes from all sources. It thus means that volume reduction of waste will include techniques that will encourage separation of waste at source. The end result of it will be to reduce waste volume to the landfill site and this will reduce disposal costs for the waste generators as well as lesser costs to be incurred by the responsible local authority in the process of the management of the disposed waste.

The South African Government is aware of the pollution problem around the country especially in and around informal settlements where no proper refuse removal functions are rendered. The problem is further orchestrated by the uncontrolled urbanization processes whereby thousands of illegal settlements are seen emerging from all corners each day. This action has prompted the government to adopt several strategies in the form of legislation to ensure that the desired constitutional obligation for a cleaner environment could become attainable. According to Lombard (1996:290) there is actually lack of capacity on the side of the government to enforce various forms of legislations that could ensure that pollution that is caused by various industries including all other invisible waste polluters could become limited. The author further states that the enforcement of these regulations will help waste practitioners to reduce the impact of pollution and this

will result in proactive rather than reactive responsiveness towards curbing of waste management crises.

2.2.2.2. Waste Recovery

The concept waste recovery actually has similar meaning with the concept waste recycling as both refer to the process whereby all discarded waste products such as papers, bottles, plastics and scrap metals, are systematically, and based on the need, collected, reclaimed, recovered, refined and reprocessed and converted into new or different products (SA 1998:3). In other words, the term waste recovery is used to describe a complete cycle from waste collection until its re-use or reproduction of new products, or secondary raw materials from reclaimed waste.

In terms of the provisions stipulated in the Minimum Requirements for Landfilling (1998:3), recycling of waste includes the following:

- Re-use – this involves the retum of a waste material either to the originating process as a substitute for an input material;

- Reclamation – where the waste is processed for resource recovery or as a by-product.

According to Novella (2002:59) waste recycling is seen as vehicle for job creation as well as a mechanism to curb the effects of unemployment. A number of operators are being

looked at which can involve sorting of waste to recover reusable products and raw materials. In other words, the concept waste recycling is largely concerned with waste reduction while it includes the separation of post-consumer materials that embrace issues such as re-use, re-processing and re-manufacturing.

Similarly Waste, Solid By-Laws that are currently operational in the Emfuleni Local Municipality as promulgated in terms of the provisions of Section 13 of the Local Government: Municipal Systems Act (Act 32 of 2000) describe the concept waste recycling as a means of sorting, processing and transportation of materials, products or containers for the purpose of manufacturing or refilling of products equal to, or similar to those of the original material or container.

According to Miller (1994:514), the need for waste recovery can be seen as a contributing factor towards curbing pollution and waste prevention. The author further states that if a public participation strategy can make residents to see trash or waste cans and dumpsters as resource containers and trash as a concentrated urban ore that needs to be mined for useful materials for recycling. In simpler terms, more money can be generated after the sale of all waste material recovered.

Even though some processes involved in waste recovery may not be beneficial to individual waste reclaimer, Purdon and Anderson (1983:364) reiterated that there is popular notion that warrants the recovery of all types of glasses. It is said however that the energy involved in returning glass to a recycling centre and then to the manufacturers for processing, is too much heavier than the energy used during the initial production of

the bottles and as a result, few people would be interested in collecting bottles for recycling.

It may be noted that recycled bottles are categorized in stock bottle that can be grouped according to their colour and be crashed while recyclable bottles are returned to the user or original company in their original form without any modification. In a study conducted for the Maseru and Maputsoe towns in Lesotho regarding the assessment of the municipal solid waste as a potential source of job creation, Mvuma and Otieno (2002:397) concluded that poor people depended mainly on income from labour to increase employment opportunities and poverty alleviation that must promote not only micro-economic stability and rapid economic growth, but also more productive use of labour. Waste management activities through recycling, re-use and composting are labour intensive. Hence, they could provide an avenue for utility of poor people's labour. In the Emfuleni Local Municipality for example, three buy-back or waste recycling centers were established with the help of the Gauteng Public Works Department to create resource centers for waste reclaimers to sell their recyclable products but such projects could not be sustained due to funding shortage.

In terms of the National Waste Management Strategy (1997:74) as adopted by the government, recycling or recovery of waste refers to the separation at source of recyclable materials from the general waste stream and the re-use of these materials which look at the objectives of recycling as a mechanism to save resources as well as to reduce the environmental impact of waste by reducing the amount of waste disposed of at landfill sites. The need to separate waste at source by the government as mentioned

above, is not only addressed to community members who are often encouraged to separate recyclable from non-recyclable waste on the collection day, but also to industries which are supposed to reduce the waste volume either by changing their production format or their packaging procedures.

Similarly, Freeman (1995:17) views the recovery of waste as highly cost-effective waste management alternative which is practised for the purpose of reducing the environmental impact of industrial operations. This can also help to eliminate waste disposal costs, reduce raw material costs and possibly provide income from saleable waste.

Heavy industries around the Sedibeng which include companies such as Sasol, Mittal (formerly known as Iscor), Samancor and African Product, are in most cases, major pollutants to the environment due to the massive ash and chemical by-products they emit. It is quite unfortunate that stone age production methods are not compatible with the current environmental requirements, and as a result, all operating industries need to operate inline with the provisions of the Environment Conservation Act of 1989, the Water Act of 1956, the National Environmental Management Act of 1998 as amended as well as the provisions of Section 24 of the Constitution of the Republic of South Africa Act of 1996 which all aim at how best the environment could be preserved and protected.

The South African Government as flanked by its Metropolitan councils, District municipalities as well as by its local municipalities is faced with a problem of continued and uncontrolled waste generation that creates unhealthy environmental conditions. As a result, they have to become involved in all activities that can lead to waste reduction in all

affected areas. Strategies that are currently pursued, as mentioned above include waste recycling and labour intensive waste management projects that can help to reduce waste volumes and also to reduce the levels of unemployment. Realising that some of the waste generated is not recyclable, Purdon and Anderson (1982:363) went to an extent of arguing that it is appropriate for the government to ban the usage of non-returnable containers for beverages or require a deposit on returnable containers, because the promotion of the usage of returnable bottles can materially reduce the volume of waste, save energy, and reduce litter. Even though an example of an ice cream cone was given as possible solution to the waste problem, a further argument was when further packaging will be required for the very same cones. In pursuance of the above, the reduction of the waste volume and the issue of job creation and poverty alleviation as advocated by the government will yield conflicting results because while one wants to see waste volumes reduced, the other wants to see people promote recycling. With lesser waste available there will be lesser benefits obtained and how will waste recycling activities be promoted to encourage new waste reclaimers to become involved?

It may be noted that the non-availability or the scarcity of certain commodities may lead to the introduction or implementation of new recovery procedures. In a workshop arranged by the Department of Environment and Agriculture and Tourism (DEAT) during November 2007 in Benoni, Professor Prvoslav Marjanovic from Wits University School of Civil and Environmental Engineering Faculty reiterated that problems of today are yesterdays` solutions. This means that, what was seen as solution to a problem identified previously, now poses a new problem currently. For example, the mechanization process that took place in the early years of industrialization was seen as a step forward towards

development with the result that cars and industries were built. The significance of this achievement was short-lived as those cars with their exhaust smoke and industries with rising dusts through long chimneys, now contribute to environmental pollution which is also contributory factor towards the effects of global warming. If municipalities expect by laws to preserve their environment as stipulated in the Constitution (SA1996), there will be some ecological degradation damages created and as a result, scarce commodities such as water will not be easily available for everyone. In a situation such as this, more financial resources will be required to remedy the situation. Currently, in greater parts of the Sedibeng District, majority of the residents are unemployed and do not pay rates because they are classified as indigents.

Similarly, the scarcity of water in Windhoek, Namibia for example, has led the authorities in that area, to reclaim water from sewage since 1969. In fact, after the sewage has been received, some primary and secondary treatment, reclaimed water is sent to the maturation pond where algae removes phosphate and nitrate in water and thereafter, chemicals such as chlorine is applied until such water could attain the required quality for human consumption. The same applies to water drawn from the Vaal in the Vereeniging area which is also not clean for human consumption before treatment (Purdom & Anderson 1982:315).

Sedibeng District Municipality is situated at the outskirts of the Gauteng province and much of its areas are semi-rural virtually with little or no income at all. A bigger average of employed residents travel daily to areas such as Johannesburg, Ekurhuleni, Pretoria and the mining area in the West Rand District Municipality. In terms of the population census

of 2004 the rate of unemployment in the area is 45%. This percentage is rather high when compared to other areas or regions. In order for these unemployed masses to survive both socially and economically, makeshift sort of employment opportunities, would have to be created. To date, employment opportunities were created in the area ranging from recycling from waste disposal sites, to removal of alien vegetation refurbishment of government buildings and litter picking services in and around Central Business District.

2.2.2.2.1. Waste Recycling

The concept waste recycling has become a "buzz" word amongst municipalities, provincial and national governments as strategy that needs to address environmental related problems, socio as well as economical concerns. Governmental institutions are on the other hand engaged in a vigorous campaign to implement measures that could help to reduce waste volumes from reaching landfill sites. To landfill sites that are currently accessible by waste reclaimers, those areas are seen as "gold mines" ready to be mined. Waste recycling has been described in the Sowetan Newspaper (1996:25) as a phenomenon that will help save natural resources and shall cut the energy needed to make new products.

Authors such as Cunningham and Saigo (1999:520) view the term recycling as bearing two meanings, namely, recycling which actually means reusing such as refillable beverage container. The difference between the two concepts is the fact that reuse of a product, entails its use without any modification while recycling entails that all materials collected are subjected to remanufacturing processes to create new products.

In simpler terms, the origin of the waste type, could determine the method that can become useful to ensure its efficient disposal. While the disposal of waste is mostly associated with the throwing away of waste by an individual, a series of benefits are always associated with the process. In the agricultural fraternity for example, most of the agricultural wastes are recycled either in the form of animal feeds and chuff from crops. Cunningham and Saigo (1999:520) explained that most agricultural wastes are recycled either as animal feeds or manure applied into the soil on the farms where they are produced because they represent a valuable resource as ground cover to reduce erosion and fertilizers to nourish new crops.

The concept waste recycling needs to be analyzed deeply in the sense that a layman often attaches a narrow view to its real meaning. There is a common thinking amongst people signaling the fact that recycling activities are typical of the poor who could only make a living out of discarded garbage. In 2002, countries of the world converged in Johannesburg about sustainable development and environmental pollution that must be avoided by all governmental institutions. Waste recycling is a business also run by rich people and by prosperous waste management companies like the Waste Group, Enviro-fill, Wasteman and others. While these big businesses make money they directly created jobs for many and indirectly, tons of waste initially destined for the landfill site was reduced through recycling (Leitch 2002:29).

On a personal capacity, and as an Assistant Manager responsible for waste management in the Emfuleni Local Municipality, the interpretation of the concept waste recycling as based upon current activities on landfill sites seems narrow and arguable. The situation in

landfill sites where people manage to gain access into, slightly differ from the above because instead of people collecting recyclable waste, most of the waste reclaimers on site look for food. Remnants of foodstuffs from different households are often found deposited at the landfill site as part of the garbage removed from different households. In some cases, it is often found that some of the foodstuffs found in landfill sites, come from expired condemned foodstuffs from affected retailers. This is where a tug of war ensues when reclaimers run for condemned food by means of denying a bulldozer on site a chance to cover such condemned foodstuffs with soil.

The challenge facing municipalities is that landfill sites that are not yet fenced like the Boitshepi and Palmsprings landfill sites are the focal point that are at risk of receiving hundreds of waste reclaimers looking for items to recycle. On many occasions, people move around delivery trucks scrambling for recyclable waste as they unload and spread the waste for covering by soil (Atkinson 1996:167). It is an unfortunate situation for one to note that uncontrolled scavenging or waste reclamation from landfill sites will continue to exist in landfill sites that are not yet permitted because there is no order regarding landfill procedures and there is also no specific entrance into the site other than permitted ones that are fenced off from reclaimers (Moeletsi & Novella 2004:73).

Several reasons might be given why people engage in waste recycling activities. According to Mkhize et al (2004:507) a recent research was conducted in Durban regarding cardboard recyclers where it was found that people became waste reclaimers or collectors as a result of factors that include lack of employment opportunities, lack of

skills, illiteracy, poverty at home, large families and a need to support a family as sole bread winner.

The authors further state that few businesses are aware of the valuable contribution made by cardboard collectors for waste management in the city thereby promoting a clean environment (street cleaning and illegal dumping). Similar to the above scenario, the Emfuleni Local Municipality as a custodian of three operational landfill sites, had in an attempt to reduce waste volumes currently deposited, organized several clean-up campaigns bearing names such as Operation Restore Dignity as well as the Bontle Ke Botho campaigns and all of which emphasized issues around the cleanliness of the environment.

To promote public participationin these programmes, the municipality offered money prize they won to be utilized to purchase a Five ton flat back truck to transport all registered waste reclaimers at a cost R10-00 per person to the waste buyers. While the municipality benefited from the reduced waste volumes at the landfill site, waste reclaimers also benefited financially from these programmes.

The concept waste recycling has become a "buzz" word in the corridors of governmental institutions such as municipalities, Metropolitan Councils and related government departments that seek to address both economic and social problems affecting people of South Africa. Waste recycling has been described in the Star Newspaper (1996:25) as a phenomenon that will help save natural resources and shall cut the energy needed to make new products. In some other sectors of recycling which involve bottles, reclaimers

tend to complain that the energy needed to ferry them to the buy-back center, tend to become too much due to weight.

In the picture below, a delivery van from a local bakery in Evaton has just dropped off packages of expired flour parcels for disposal at the Palmsprings landfill site. Interestingly, some people found at a landfill are not only looking for recyclable materials, they are also looking for some food hence such flour parcels ended up being taken home for human consumption by some waste reclaimers.

Figure 2.1

Expired flour destined for household consumption at the Palmsprings Landfil site.

Figure 2.2 *Expired bags of corn*

To the government as well as local municipalities the main concern is to see waste being managed as stipulated in the Minimum Requirements and that rotten foodstuffs that are found in places such as these are not supposed to be used for human consumption. Many landfill sites in Sedibeng District are not fenced while others lost their fences due to vandalism. In the Sun Newspaper of 20 March 2008, it was reported that the town of Managua, in the Nicaragua, is sinking under the pile of garbage and this was caused by the existence of the dispute between hundreds of homeless people who pick through the

city's dump looking for items to sell such as plastics and metal, and the workers seeking to supplement their wages.

In other words, workers have actually stopped performing their duties of removing waste and started to become scavengers as well. The same problem can befell the Emfuleni Local Municipality due to the fact that some workers tend to become waste recyclers thereby delaying services they are paid for in front waste reclaimers from both Palmsprings and Boitshepi Landfill sites.

Waste recycling, is an indication that all the wastes destined for a specific landfill site can be intercepted before they could reach the disposal site and could be used for something else. It may be pointed out that 50% of the municipal waste stream comprises papers, wood, leather and textiles that are biodegradable. Such waste can either be reused or be composed. In the Sedibeng District for example, a Waste Recycling club was established in the Vanderbijlpark area under the auspices of the Rotary Club to encourage people to continue with recycling. According to these programme, people are expected to collect waste at source, which is waste from houses that are put outside by residents for kerbside collection as according to scheduled collection days before municipal waste trucks could commence with their day to day kerbside collection function. In the United States for example, millions of people sort their trash and deliver them to Buy- back centers for cash while others place their trash outside for kerbside waste recycling and this goes back to the issue that the type of waste often found will vary according to one's financial status (McKinney & Schoch 2003:460).

Generally, waste recycling is seen as a solution to a series of problems pertaining to waste management. While it is safe to assume that through recycling, wastes volumes will be drastically reduced, the increase in the industrialization and urbanization around the Sedibeng District Municipality have caused an ever-increasing effluence that has greatly compounded the problem of waste management. Along those lines, Keller (1984:291) reiterated that although waste recycling will continue to take place, it does not mean that all the waste generated will be recycled but it is of importance for one to note that the increasing cost of raw materials, energy, transportation and land will make it financially feasible to recycle more resources as well as to reuse the land where wastes not recycled are buried, thus creating new land resources for development.

2.2.2.2.2. Waste Treatment

In terms of the National Waste Management Strategy (1996:86) waste treatment is seen as a process that is utilized to minimize the environmental impact of waste before its final disposal. This entails issues such as composting of garden refuse, waste reuse in its original form for general waste while hazardous waste treatment technologies required include issues such as solidification, immobilization, cementation and encapsulation which aim to reduce the leachability and mobility of hazardous constituents.

Waste treatment mainly focuses on the treatment of all hazardous waste as well as medical waste from clinics and both private and public hospitals inline with the provisions of the Minimum Requirements for Landfilling (SA:1998) with the sole purpose of attaining the following objectives:

- To reduce the toxicity of the harmful components so as to minimize the impact of hazardous waste on the environment, and

- To comply with the relevant Acts of parliament and the Minimum Requirements for treatment and disposal.

The term waste treatment might be carrying different meanings and interpretation depending mostly on the place where it is used. Fuggle and Rabie (1992:498) see waste treatment as referring to the treatment of waste in order to transform it so as to facilitate cheaper transport and disposal procedures. In other words, there are some benefits that can be attached to this treatment process that will ensure that the end result will meet the required need. The authors further see waste treatment as carrying better benefits through thermal treatment when processed as follows:

- Incineration: the destruction of waste through fire with the purpose of ensuring volume reduction before final disposal. This may include both low and high technology incineration depending on the area where they are used and the amount of waste to be controlled. For example, central heating system of water is prevalent in areas such as the Netherlands to ensure that everyone in that country does have access to hot water. In other words, the authority in charge will be hitting two birds with one stone when they reduce the volume of waste and simultaneously manage to supply its residents with hot water through use of insignificant or unwanted waste materials,

- Pyrolisis of wastes which is a process of heating waste material in an oxygen deficient atmosphere in order to convert burnt waste into gaseous or liquid substances that can further be used like the manufacturing of low grade petroleum-type gas and oil in the process, and

- Refuse-derived fuel (RDF) and Waste-derived fuel (WDF) is the type of fuel, which is the end result of the burning of waste material as well (Fuggle & Rabbie 1992:499).

There is always a presumption that all forms of waste are not environmentally friendly and may lead to environmental pollution. This notion has led to the introduction of a strategy that will ensure that all forms of waste are subjected to treatment or detoxification before they could be landfilled. This strategy is mostly applicable to landfill sites that could accommodate hazardous waste which can, even in low concentrations, have a significant adverse effect on public health including the environment (SA 1998). Authors such as Soyez and Plickert (2002:70) stated that waste treatment is aimed at the reduction of the mass, the volume, unpleasant smell from decomposed objects, the toxicity and the reactivity of waste, in order to minimize the environmental impacts from waste depositions.

As highlighted earlier, the effects of population increase as well as the effects of the urbanization processes are gradually being felt by municipalities operational in their respective areas. Manufacturing industries around the Sedibeng District Municipality,

contribute much to the pollution problem as loads of contaminated ash products are often dumped in existing landfill sites without the operators realizing the potential danger brought to the site. It may be noted that any form of waste that enters any operational landfill site, must be screened to ensure that relevant wastes must be deposited in relevant landfill sites. In some other cases, in parts of the undeveloped areas around the Sedibeng District Municipality, polluters who tend to stealthily pollute at night, often target such areas. The issue at hand is that these offenders fully realize where they are supposed to dump the waste in question but because one is expected to pay a disposal fee at the landfill sites such an issue becomes a tall order for one to follow.

Further, while others are aware that the type of by-products produced around local industries is not supposed to be dumped in local landfill sites, because all existing landfill sites are only meant for General Waste not suitable for hazardous, chemical or medical wastes, one sees it better to dump such unacceptable waste in any undeveloped piece of land that can become available in the same proximity especially at night. Similarly, the type of transport utilized in the process will invariably be without plate numbers to evade recognition. It may be noted that all landfill sites that are currently operational in the Sedibeng District (2008) are only suitable for general waste while hazardous waste are mainly handled by special waste management companies. These are transported to the Holfontein (H:H) hazardous landfill site that is owned by the Ekurhuleni Metropolitan Council. Medical waste generated locally is currently handled or incinerated at the Robinson Landfill site situated in the Boysens area.

A major problem of waste treatment is that many industries in the Sedibeng District Municipality such as Mittal and Cape Gate in Vanderbijlpark, Samancor, EMSA, Everite and African Products in Meyerton process bulk materials during the production of commodities such as electricity, steel, petrol and bricks. It may be noted that industries mentioned above, are just but few that are located not far away from each other. According to Keller (1996:321) the seriousness of pollution or contamination of water resources by-products or ashes from these industries, made to the government to put pressure on all manufacturing industries to introduce new technology in the manufacturing processes to curb any form of pollution. The aim to introduce new measures seek to address the problem of pollution that is negatively affecting the environment and this can be achieved through removing whatever corrosive and harmful wastes from these industries in question and this will include dissolved organic materials that might be present in some waste. This is so especially with the wet waste that can be deposited in landfill sites. If such mechanisms can be put in place in industries around the Sedibeng District, the toxicity rate of waste in the area will be minimized or eliminated.

As sources of waste might differ, their toxicity level will differ as well and this may pose as problem to people responsible for the maintenance of a specific landfill site. There are about eleven operational landfill sites in the Sedibeng District Municipality and to date, not a single one is licensed (February 2008). These run in contravention of stipulated provisions in the Minimum Requirements for Waste Disposal by Landfill (1998). These stipulations further impose the Dos and Don'ts` that include the construction of building structures where after, others will be used as a laboratory for assessing the types of waste that is buried. A confusing fact is that none of the above can be established before

an operational license is issued. In simpler terms, landfill sites around the Sedibeng District currently operate illegally.

In terms of the provisions of Section 20 of the Environmental Conservation Act, Act 73 of 1989, no person may establish or operate a waste disposal site without a permit issued by the Minister of Water Affairs and Forestry. This Ministerial obligation still stands. It may be noted that some landfill sites operational in especially formerly disadvantaged areas were just backyard illegal dumps as no house to house refuse removal services were then available in those areas. Realizing the dangers associated with environmental pollution as a result of uncontrolled waste disposal methods, Robinson (1996:35) highlighted that pre-treatment of wastes before landfilling is seen as a possible means of assisting in reducing subsequent timescales involved, and also, there is a growing lobby of support for incineration as a means of degrading organic components before landfill disposal of ashes is done.

While it is generally acceptable that the usage of recycled waste will differ from country to country, depending on the technology adopted in use, there is a need to ensure that this activity becomes sustainable for the future. In Sweden for example, an automatic process sifts glass and metals out for recycling, and the wastes are burned in a sophisticated incinerator in order to generate heat that is used mostly for apartments or to smelt snow and ice on the pavements and roads as well as to generate electricity. According to Miller (1996:541) out of the above benefits, waste recycling proponents would cost less if more emphasis were placed on creating a demand for goods made from recycled materials

through the establishment of certain standards that will be adopted in line with the legislation.

According to Mkhize et al (2004:507) waste scavengers, as they were initially called, are often viewed as a nuisance and a security threat. Majority of these people are unemployed and homeless and can only manage to survive through waste recycling, and also by harvesting or collecting discarded foodstuffs for consumption. In most cases people residing in or around landfill sites do so as a way of ensuring that an earliest bird residing near the source, will get more rewards before others could also arrive for their daily search reusable wastes. Mostly, these are destitute individuals who are homeless with no other means of survival.

It may be noted that waste recycling is an activity that must benefit all stakeholders involved in the management of waste. These benefits require a triangle of waste where the producers who are either industries or private individuals will yield recyclable materials to reclaimers or other companies who are on waste exchange programme and lastly lesser waste is sent to the disposal site, which is a benefit to the municipality. In line with the above triangle of waste management, a similar project was initiated by Polifin, which is now part of Sasol Chemical Industries, to sort out and separate waste in the company's waste stream for recycling. The programme started with few individuals and, eventually, the number increased. The spin-offs of the programme, which are earnings from the sale of these recyclables received by team members, have to be used to purchase vehicles to assist with the programme. The company has in turn saved a lot of

money on their solid waste disposal bill because lesser waste was made available for disposal at the landfill site (Freeman & Barclay 2000:296).

Interests amongst waste reclaimers differ from person to person hence the different methods applied to retrieve such recyclable materials. Due to increase in technology, obsolete materials are mostly created. For people reclaiming copper, they have to go through the process of skinning old insulated copper cables while those that are recycling plastics have got to go through the process of sifting through the deposited waste or even to break down existing items such as old computers for either plastics or copper components used in the manufacturing of such items.

Similarly, in the case of retrieving metal from old tyres, reclaimers need to burn down those tyres while the question of environmental pollution is totally disregarded. At times, tyres are burnt to raise steam that can be utilized in the production of electricity while in some other instances, tyres can be burnt to acquire heat that can be used in cement kilns or be used for central heating in countries such as the Netherlands (Gore 1996:218).

It is not only South Africa that feels the pain of handling increased waste volumes but other countries in Africa have echoed the same sentiments about waste as unnecessary wasteful expenditures that are incurred by either municipalities or the government. These could have been avoided had offenders or polluters not resorted to haphazard dumping activities. In the Southern African Development Community (SADC), the effect of waste generated from different households as well as from commercial centers, is not just a minute thing that cannot go unnoticed. Botswana as part of the SADC region experienced

waste management problems that ranged from collection to disposal and as a result, its government went to the extent of formulating the Botswana's Strategy for Waste Management in 1998 which later formed part of the Waste Management Act, Act 15 of 1998. According to the Act, the government promotes, amongst other things:

- Research and development on reuse and recycling technologies,

- Creating outlets for the products of reuse and recycling, by enforcing the use of recycled materials or products within government institutions and state-owned companies,

- Optimizing collection and sorting system, and

- Reducing the external costs of reuse and recycling (Ntlhayakgosi 2000:48).

Waste recycling not only focuses on job creation alone, but there are other push factors that need to be identified as well which include amongst other things, the protection of the environment. For recycling to continue, there can be a need amongst buyers that the type of waste material they are in need of might no longer be readily available which may cause a delay in the delivery of required products. In the Citizen Newspaper of 30 March 2008, it was reported that companies responsible for glass manufacturing have widened their collection net to outside Gauteng which was initially seen as a stumbling block, to ensure that more glass is collected. It was further stated that this was prompted by the

fact that industries are currently experiencing the glass shortage in order to satisfy consumers.

2.2.2.2.3 Waste Composting

The trend around waste management as practised within municipalities is to ensure that waste volumes from all sources are reduced or brought under control. Practitioners in this field are always looking at the adoption of better ways and strategies that will ensure that the intended goal is obtained. Composting of waste is seen as one of the better strategies that can be applied by a municipality to reduce volumes of garden refuse from being part of the waste destined for disposal at a landfill site. The term composting refers to the degradation processes of organic materials. In simpler terms, composting could help reduce the volumes of organic material or garden refuse that is mostly created by garden services. According to Keller (1996:324), waste composting is a biochemical process in which, organic material decompose to humus like material.

Composting, as defined in the Fertilizers Act, Act 36 of 1947, is referred to as a homogenic, completely fermented material of animal or plant origin to which no plant nutrients have been added. Van Heerden (1996:329) indicated that the issue around turning household waste into compost is quite a historical matter. This was demonstrated in the ancient Greece where subterranean structures were built to receive waste where it was apparently allowed to ferment anaerobically. Similarly, making a compost was a common feature in the 1890`s in the Netherlands but this idea did not last long. However, because of the shortage of fertilizers during the Second World War due to the production

of gun powder and other propellants, this prompted the renewed interest into the process of waste management by way of making compost.

Compost is generally planned or focussed at the creation of manure as well as the reduction of waste volumes that is supposed to be deposited in the landfill sites. It is a common factor that all waste materials must be deposited in a landfill site but in the absence of such resources, what then? In the Emfuleni municipality for example, the problem of airspace availability, has started to have an impact towards proper waste management. Operators at the landfill site refuse garden services to dump their garden refuse such as tree branches on the site as a way of preserving airspace. It may be remembered that composting activities, whether it is done by the municipality or by a private company, can help to create some form of employment. Giggey et al (2000:263) reckon that through composting, some entrepreneurial opportunities can be generated. In other words, with composting activities, small businesses can be formed to provide waste and transportation services including the operation and maintenance of neighbourhood disposal stations for source-separated organic wastes.

The Parks Division of the Emfuleni Local Municipality had a mini-compost center behind the Vanderbijlpark vehicle testing station that was continuously fed with fresh tree cuttings during the pruning of trees that is done by the department. As soon as more trees happen to be cut, tree leaves and branches are made available and that leaves the area with lesser space to prepare them for the process limit space available. Fewer branches of trees will be needed to increase the compost volume as well as the storage of such tree branches and as a result, this bottleneck of tree branches in a small given space, will

automatically start to create problems for the department. Due to shortage of personnel to look after the project, the site was abandoned around 2005.

In order to avoid similar problems, the department has opted to distribute such wood to strategic points in informal settlements not far from the Parks Division depot where municipal officials will be able to monitor all the activities when people collect such wood. This action was also stopped after it was realized that some officials started to see an opportunity of enriching themselves through the sale of such wood during 2007 instead of dishing out those pieces of wood to needy people for free. The initial objective benefited both the community and the municipality in the sense that people got wood for free and lesser waste was sent to the landfill site for disposal thereby saving the valuable airspace needed in any running landfill site. The opposite is the case at the moment. The issue of capacity of the municipality led to the closure of such a facility and only the few remaining compost heaps as shown in the following picture could still be found in the area.

A series of problems with regard to global warming have been identified whereby it was reiterated that too much water leaves the ground through evaporation and as a result, the country will soon run short of fresh water. According to Leitch (2001:28) it is important for one to note that if South Africa is to feed its people in the foreseeable future, the country must follow the sustainable agricultural trend which include composting of biodegradable material which are being set globally. With composting, physical conditions of the soil structure will be improved and the same will apply to the improvement of the ground water retention that will enrich the soil's bacterial activity.

Figure 2.3 Abandoned compost site at the Emfuleni Parks Division yard

2.2.2.2.4. Waste Reuse

The concept waste reuse is mostly used in line with what people interpret as waste recycling. Waste reuse entails that the type of waste before the end –user must be used in its original form. Other than waste recycling that has got to go through a process of re-manufacturing, waste reuse refers to the usage of the product without any modification. According to Cunningham and Saigo (1999:524) the usage of waste in their original form is better for the environment than re-smelting virgin materials for new products. The authors further state that reusable motor car parts that are purchased from scrap yards

helps the end user to obtain a replacement part for vehicle at half of what was supposed to pay for a new one. The part acquired would not have to go through the re-manufacturing processes that will further contribute to environmental pollution.

The rationale behind the reuse of waste has two pronged advantages. The waste volumes to landfill sites, is drastically reduced while the need to acquire new products by packaging companies, will be reduced as well. New products are becoming more expensive to manufacture due to the scarcity of raw materials. Further, pressure against manufacturing industries, to comply with applicable legislation, will ensure that the environment is being protected, and has become another deterrent to manufacturing industries not to become a liability for the government. According to Miller (1994:515) if the usage of refillable bottles can become an option, the advantage is that such bottles can be used more than 50 times before being scrapped. The author further stated that collected and filled bottles at local bottling companies reduce transportation costs, energy costs and create jobs.

Leading companies around South Africa are aware of problems related to waste management, waste recycling and reuse whereby swelling ranks of hundreds of companies actively support material recycling and waste reuse in an attempt to protect the environment while at the same time making money for a good cause. Similarly, Cummins of South Africa together with WWF. South Africa and Mzansi Office Recycling that specialize in recycling obsolete office equipment and cartridges took a joint decision to initiate a "save the earth" campaign to encourage all stakeholders to intensify their waste recycling efforts in line with their intended objectives. According to Knoll (2008:41)

stakeholders are aware that existing municipalities are fast running out of landfill airspace and each one of them (stakeholders) can play an important role in saving natural resources as well as the said airspace. Knoll further stated that this objective can be realized if both individuals and companies can become involved in the recovery and reuse of all office disposables including toner cartridges products.

It may be noted that the terminologies in use nowadays often complement each other. Moreover, Barclay & Buckley (2002:2) caused further confusion regarding the above when they stated that re-using and recycling of waste is accomplished either by using the waste generated directly or after treatment as this will help in eliminating disposal costs, reduce raw material costs and may also provide income from the sale of the recovered goods.

2.2.2.2.5 Waste collection

The Sedibeng District Municipality is part of the industrial hub of the Gauteng Province and as a result scores of people move into the area in search of employment. The increase in population figures as coupled with economic development has left the District with a daunting task of managing increased waste volumes. In various parts of the District, solid wastes of various kinds are collected from different source which include, private households, industrial areas, governmental institution as well as waste from illegal dumps by municipal employees in their efforts to render a clean environment. The collection of waste is, also done by private companies who are capable of rendering a specialized waste removal service. The need to collect waste is according to Atkinson et

al (1999:75) a way in which waste from different source is going to be managed because most waste that is seen lying along the main roads, has just been dumped with no proper precaution pertaining to waste management. That results in heaps of stinking of uncollected waste mostly in and around public open spaces, in valleys and in drains. It may be remembered that methods adopted in this process, differ depending on the type and nature of waste at hand.

2.2.2.2.5.1. Household Collection

Depending on the financial status of an individual municipality, household refuse collection function is normally rendered once a week to each household. There is a common belief that from private households, only general waste is collected. According to Atkinson et al (1999:163) waste from different households or municipal solid waste, is mainly garbage comprising household refuse and discards from smaller trade premises. In terms of the provisions of the Minimum Requirements for Landfilling (1998), general waste from private households will only be allowed to be disposed of in general landfill sites while chemical wastes including medical ones will be disposed of in specialized landfill sites.

The provision of waste removal function is to ensure that all forms of waste that can end up polluting the environment must be totally removed from residential areas but the problems facing municipalities are enormous causing municipalities to fail in their quest to clean the environment. Problem of increased urbanization poses a further problem as the growth of informal settlements is often too fast to the waste removal facilities to keep up

and as a result, townships and squatter camps often accumulate massive piles of domestic waste which have become a breeding ground for diseases. Kemp (1998:426), in the Environmental Dictionary explained that problems arise when waste is produced in such quantities that the normal disposal system cannot cope or when the waste takes such a form that existing system can dispose of it only slowly or in some cases, not at all.

The increase in technology as well as the standard of living has further worsened the problem because what was perceived as being manageable, seems to be gradually getting out of hand and was becoming complicated during its collection. According to Purdon and Anderson (1983:363), the widespread popularity of disposable children diapers or nappies from different household, have added a new hazard to solid waste handling. It may be remembered that many of these diapers are haphazardly thrown all over the area and as a result, flies and rats that come into contact with them, can spread intestinal diseases of infants while municipal waste collectors are at the risk of getting exposed to the eminent danger of such sicknesses.

While it is highly acceptable that household waste collection focuses on smaller volumes of waste normally in black plastic bags, times are changing that the majority of people are now residing in densely populated areas where such individual arrangement will further frustrate the plan. According to Barnard (2004:195), black bags can be used in more formal areas where the waste density is usually lower. In highly densely populated areas, wheelie bins will make more sense due to their larger capacity. This approach was adopted for the Evaton residents in 2007 by the Gauteng Housing Department in line with the Evaton Renewal Programme to provide them with 240 litre bins to cater for both

property owners and their tenants. It may be noted that methods applicable to waste collection will change with time and will continually differ with population statistics.

2.2.2.5.2. Business Refuse Collection Service.

The origins and types of waste at hand, will automatically determine the type of transportation that will be required, types of receptacles as well as the area suitable for such waste receptacles to be placed. It may be remembered that in and around industries, both general and hazardous waste is often generated, the same applies to medical centers where specialized private companies would have to be utilized for that purpose. While it is safe to say that general waste from different households, equals the general waste generated from industries even though they differ according to their volumes, according to Smith (1976:254), a great deal of trash is a result of planned obsolescence designed to keep industries going while industries generate around 15 million tons of scrap annually with paper industries being responsible for the generation of 30 million tons of waste annually.

In the Sedibeng District Municipality, general waste from businesses is collected each day in the Central Business District (CBD) because of increased package wrappers. In terms of the Minimum Requirements for Landfilling (1998), it is of importance that all waste that should be collected, should at least be next to the point of their origin and should not be allowed to lie around there for a lengthy time as it will result in aesthetic problems. In other words, if any accumulated waste can remain on specific spot and result in aesthetic

problems, the generator of such waste or the person contracted to them to remove such wastes would have to be held liable.

The collection of waste amongst households and business often differ, notwithstanding the fact that businesses pay more for the waste they dispose than private households. According to Fuggle and Rabie (1992:497) it is clear that strategies pertaining to waste collection and its storage, has been highly mechanized due to the size of the bulk of waste material handled that are created by industrial methods associated to bulk material disposal.

Of importance, types of waste containers utilized in the industrial sector vary due to their intended nature and purpose. It may be remembered that, while some industries produce excessive volumes of by-products such as ash, others produce small volumes of waste that warrant special form of containers to handle. It is not surprising for one to learn that industrial waste collection is a specialized function that requires specialized containers to that effect. For instance, if a clothing factory could generate fabric off-cuts while furniture would generate large wood off-cuts and saw dusts, it could be easier for such industries to remove such waste using contracted service provider who will in turn deliver such waste to recycling centers or either for reuse. Similarly, the Emfuleni Local Municipality stopped rendering bin service and outsourced that function to a private service provider and any interested party to the waste intended to be removed, had to make contact with the said company (Mkhize et al 2004:507).

Waste reclaimers mostly focus their search for recyclable materials in town centers where major business activities take place. It is from these businesses where waste reclaimers obtain their goods in the form of waste papers, slag and ash. Business waste is generated in office blocks, shopping malls, retail stores and other commercial premises and waste from these premises is sorted into recyclable fractions such as cardboard and paper and is compacted for delivery to recycling companies for a price. Meyer (2006:38) made a comment that much can be said about waste avoidance but the general notion is that condemned food waste is always found in landfill where waste reclaimers normally anticipate their coming and these wastes containing foodstuffs are generated far and wide from factories that produce bottled tomato source or tubs of margarine until to the scraps from restaurant tables or bits and pieces with an expired foodstuffs in household fridge.

2.2.2.2.5.3. Removal of illegal dumps

Municipalities under the Sedibeng District Municipality are currently faced with a problem of illegal dumping. These dumps are mostly found along main roads, public open spaces and behind backyards of existing settlements. To a larger extent, illegal dumps emerge in areas where no proper house-to- house refuse removal services are rendered. In a report tabled by the Gauteng Department of Agriculture, Conservation and Environment and Land Affairs (GDACEL 2002:22) regarding the development of an Integrated Waste Management Plan, it was stated that illegal dumping could be referred to as waste that has been left at any place not designated as a waste processing facility or waste disposal site. In other words, waste found in an illegal dump cannot be linked to the owner hence it

will be difficult for an authority to remove such waste as it was not part of the refuse removal programme.

In the Draft Integrated Waste Management Plan (IWMP) for the Gauteng Department of Agriculture, Conservation, Environment and Land Affairs during May 2002, illegal dumping was seen as often associated with the lack of or poor collection service and in many areas has become a waste management problem. It was further stated that while it is noted that the cost of removing such illegal dumps would be too much high, it was mentioned that the reasons for consistent illegal dumping could be linked to the following:

- Poor or no collection service provided;
- Lack of effective By-Laws;
- Poor law enforcement of existing By-Laws, and
- Lack of education and awareness (Strategic Environmental Focus 2002:2).

Invariably, the existence of an illegal dump in an area may create health hazard to nearby residents. It may be noted that illegal dumping is an action of dumping waste illegally in an area or spot that is not suitable for dumping. Further, waste found on an illegal dump cannot be linked to an individual unless one was seen doing that. Some forms of waste found dumped illegally have got medical sharps while others seems to be contaminated with chemicals from industries that can create problems for residents nearby. The

problem of illegal dumping is not only found in the Sedibeng District Municipality alone, but worldwide. In the United States of America for example, there are between 32000 and 50000 waste disposal sites, and in some of these, there is a probability that more or less 2000 of them, can contain sufficient waste that can be of serious threat to public health and the environment because the emergence of uncontrolled waste disposal sites may be from points where they can pollute the soil and ground water resources in various ways (Keller 1984:296).

The interpretation of the concept illegal dumping is an indication of types of waste that is found dumped without any proper control. This action is similar to the issue of open dumps whereby people dump waste wherever they wanted. In the early days of civilization, the population figures around the Sedibeng District Municipality was then low and there was no need for one to think about establishing a landfill site. It may be remembered that during those days, the types of waste that were generated was nominal and did not contain chemicals as is current. According to Keller (1996:325) open dumps that then existed were seen as the best spots suitable for dumping. Open dumps that were in the form of quarries were mostly found after the excavation of topsoil during development. Open quarries are normally found located at the back of many developed areas. It is in these open dumps where waste is found piled up into heaps of stinking trash while such heaps will also be burnt by people in an attempt to get warmth from the discarded waste. Other than the above, there are places where recyclable materials are normally collected by waste reclaimers.

2.2.2.2.5.3.1. Promoting Secure and Healthy Environment

Municipalities are, through provisions of the Local Government: Municipal Systems Act (Act 32 of 2000) as read inline with Section 24 of the Constitution Act (Act 108 of 1996), custodians of the environment and they need to ensure that whatever is done within their area of jurisdiction, does not pollute the environment. Consequently, municipalities would have to adopt strategies that will ensure that the environment is protected against pollution for human habitation. To promote a secure environment is a process and not a method. It was identified by Barclay et al (2002:347) that lack of knowledge is a catalyst of many environmental problems and as a result, a programme was initiated that was aimed at the promotion of the use of cleaner production to reduce the environmental impact and at the end, this will help transfer knowledge on cleaner production to industries and to create awareness of environmental problems as well as how to solve them.

The fact that municipalities are the custodians of the environment does not mean that residents must continue to dispose waste wherever they wanted and wait to see efforts and means to be taken by municipalities to solve the problem. It is a known fact that uncontrolled waste may result in bad aesthetic environmental conditions that will ultimately affect them. It is important for people to understand the importance of the environment for their own existence and must recognize that their practice can result in negative environmental conditions even if it may not be from their immediate vicinity but far from their homes or even countries (Grobbelaar 2002:367).

In an attempt to ensure that this idea should manage to reach both industries and the population at large, municipalities, as they are responsible for the management of waste deposited in their landfill, should inform all waste producers, be it general or hazardous, that there would be some financial payments required from them for the cleaning of such waste deposited in landfill sites as this will help municipalities to upgrade the status of their landfill sites. In the Sedibeng District Municipality for example, clean-up campaigns are always organized by the municipality to involve members of the community to take charge or clean all forms of waste strewn all over their areas. Clean-up campaigns form part of public awareness on what needs to be done in a specific area. The government on the other hand has initiated campaigns such as Bontle-Ke-Botho clean and green campaign to encourage people to keep their areas clean. It is rare that private industries are seen participating in events such as these because on many occasions, they are the culprits. In support of the above, Molao-Chikanda and Tebele (2002:385) explained that the policies and legal tools that are employed in waste management as well as their support, is highly dependent on informed, motivated and participatory public. Authors further reckon that strong public awareness programmes can encourage and enhance community motivation hence there is a need for sound initiatives in these waste management activities.

It would not be far fetched for one to note that public participation to meeting called by municipalities could either be influenced by the interest one has on the subject matter or as a culprit to the problem. In terms of Section 32(1) (b) of the Constitution of the Republic of South Africa Act (Act 108 of 1996) any information that is held by any other person to the exercise or protection of any rights must be made available to the one who

wants to prove the contrary. This was evident in the issues surrounding the Margolis hazardous waste disposal in the Germiston area where, in the interest to protect the environment, residents around that area held a series of meetings about the status of their environment and they complained in a letter to the President of the country to stop what was viewed as deliberate pollution to the environment (Ligthelm 1996:171).

2.2.2.2.5.4. Bulk Refuse Removal

Bulk refuse removal function forms part of the Key Performance Indicators (KPI) of the waste management division of a municipality. Bulk services are rendered using heavy machinery including skip loaders. Bulk services in a municipality, is that type of services rendered by municipalities to residents using sophisticated equipment not available for ordinary citizens. For major household services, skip bins are mostly utilized. The need for municipalities to use skip bin or loaders, vary from area to area. In the business world, skip bin is normally placed in strategic positions where all users within that environment would be able to use. In the Emfuleni Local Municipality for example, skip bin service was outsourced to a private company after it was identified that the service needed to be upgraded and more funds will be needed to that effect. The need to use skip bins will solely depend on the financial sustainability of the programme of the municipality other than putting themselves into financial difficulties due to the fact that the majority of the people may not pay for services rendered to them by municipalities (du Plooy 1994:20)

In the early 1980 `s, waste bins were then seen as a solution to waste collection system and were mostly placed on street corners to ensure that maximum waste generated is

thrown into them. This type of situation is normally found in front of business premises to intercept waste wrappers from shops. A similar scenario is when a bin is placed next to residential household where it was found that waste was instead found thrown around the bin itself because in some other instance parents often send their young children to dispose waste into a bin which is far bigger than their size and as a result, they are compelled to dump that waste next to the bin. The need to use bins is also directed at cost savings. Dierwechter and MacDonald (1996:195) reiterated that in the normal situation, the removal of communal waste using traditional skip by municipalities is mostly done in relation to financial benefits envisaged by municipalities. In other words, shortage of funds for a municipality to implement a proper house to house waste collection service may lead to the adoption of a service that will suite their financial strength.

The type of a waste management system acceptable and become suitable for an area, will depend on whether community members perceive and accept that as a solution to their needs. In sparsely populated areas like in Namibia for example, local bins allocated for community use were allocated based on the fact that the population in the said area was still low and the volume of waste generated was also low and the volume of litterbins used could accommodate more waste to reduce the movement of the contractor responsible for their removal as well as reducing costs incurred by the responsible municipality (Otto & Sauramba 2002: 294.)

2.2.2.2.5.5. Maintenance of Mini Dumps

Mini dumps are also known as waste transfer stations. In the Sedibeng District Municipality for example, there are five mini dumps stations of which four of them are situated in the Vereeniging area and one is next to Ratanda in Heidelberg. Mini dumps are normally established as temporary waste disposal station for either the community or the municipality itself whereby the responsible municipality will later collect such waste for disposal at the landfill site. Reasons for the establishment of temporary waste always range from shortage of space or land to establish a waste disposal site to long distance that is travelled normally by municipal trucks to landfill sites for waste disposal. A similar situation was experienced in the Knysna area where a problem of land shortage led to the establishment of a waste transfer station to cater for the municipality need. Waste collected from different households is compacted into railway carriages in a service called Waste-by-Rail to the disposal site out of town. This type of service was copied from the United States and Europe where it has been used with great success (Bohler 1999:12)

At times, there are types of waste generated from households that is not compatible with the house- to-house collection system in use. These types of waste range from builder's rubble to garden refuse. Municipal waste compaction trucks are not eligible to collect builder's rubble and garden refuse because of their sizes and volume. It also requires more funds and energy and to load them into a truck to ferry to a disposal site. Mini dumps are special places created by a municipality to allow residents to dispose such garden refuse or builder's rubble. During the planning of services in an area, municipalities equally look at the need to ensure a sustainable service to its people that

will be affordable. According to Dunckley (2000:448) the usage of rail transport as adopted in Knysna to transport waste from a transfer station was found to be a more economical option over the longer transportation distances to regional landfill sites and, in addition, rail transportation is regarded as more environmental friendly.

Existing landfill sites around accept only general waste while medical and hazardous waste, is handled by private waste management companies. It may be outlined that forms of waste are almost the same, but the type of waste content deposited in a mini dump differ with the contents of waste deposited in a waste transfer station. Basically, the two serve the same purpose, which is to temporarily store waste for the disposal to the landfill site. In mini dumps, waste deposited includes waste from demolitions of houses and parts of trees cut during felling season but waste deposited in a waste transfer station, is waste compatible to household collection system in place and that type of waste includes paper, textile, kitchen waste like vegetable peels and at times, tins and bottles. The rationale behind this temporary storage is that in some other areas such as Heidelberg, there is no landfill nearby and all waste collected must be transported to the landfill site outside the boundaries of the operating municipality, which is Ekurhuleni in this instance. In view of the above, municipalities using small household compaction trucks may be required to collect waste from its rounds and deposit it at the transfer station for a bigger truck to transport it to the main landfill outside town (Bohler 1999:12).

Mini dumps are established to curb the problem of continuous illegal dumping that is created by residents. In the Vereeniging area for example, residents are allowed to use them for garden refuse only but the problem currently experienced is that some residents

with waste left behind during the collection day see mini dumps as possible places for the disposal of such waste. In some other instances, residents who want to deposit waste at a landfill feel threatened to do so due to problems of unruly waste reclaimers.

2.2.3 Conclusion

People are bound to create waste in an attempt to create food or some form of shelter to ensure their survival. The rationale behind the concepts waste and waste management, is to address problems and challenges that emanated from processes utilized in the entire survival process. In other words, the idea is to ensure that all problems created are not supposed to create new problems that will require more funds to rectify. In terms of this study, the idea is to find ways and means that could ensure that the constitutional obligation propagated in the Constitution Act (108/96) could be realized.

In the following chapter, much emphasis will be placed on how waste classification, handling and disposal techniques are conducted in the Sedibeng District Municipality.

CHAPTER 3

WASTE CLASSIFICATION, HANDLING AND DISPOSAL TECHNIQUES IN THE SEDIBENG DISTRICT MUNICIPALITY

3.1 INTRODUCTION

The existence of different waste types warrants the adoption of new strategies and better methods that could ensure environmental sustainability. Challenges stem from shortage of equipment to financial capabilities of individual municipality. As it is commonly known, municipalities are responsible for the collection of general waste from all sources within its boundaries while medical and chemical wastes, are handled by private waste management companies which do not report their daily activities to municipalities. Municipalities carry the constitutional mandate (108/96) of ensuring that the environment is not harmful to lives of the people and that residential areas are clean and are free from all forms of pollution.

According to Atkinson et al (1999:76) private households and firms including those that have contracted services with private waste management companies, often exonerate themselves from any obligations after the removal of waste from their domain while the final disposal for such waste will be the responsibility of municipalities. To minimize these possibilities of problems to both the environment and human health, municipalities should introduce new By-Laws that will help them to widen their involvement capacity with regard to the management of waste of all forms including those handled by private companies.

This chapter describes the classification of waste and the strategies adopted thereafter, the handling of waste and the various waste disposal techniques utilized by municipalities in an attempt to render their areas clean as well as the identification of appropriate strategies compatible with the waste management system in the Sedibeng District Municipality. Options to be utilized in the waste management processes will include issues such as waste transfer, waste incineration, wastes exchange as well as the maintenance of mini dumps and street sweeping functions as part of core activities performed by waste management departments in order to keep the environment.

3.2 TYPES AND SOURCES OF WASTE

Types and sources of waste may differ from area to area and also as according to the nature of waste at hand. Various forms of waste found in an area, come from industries, residential areas, schools, clinics, hospitals, and from mines. The term waste stream is used by Cunningham and Saigo (1999: 469) to describe the steady flow of varied waste that is produced from all sources including garbage from residential household, waste from construction areas as well as waste from industries. This explanation corresponds with the definition given in the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (1998:1) where the term waste was defined as an undesirable or superfluous by-product, emission, residue or remainder of any process or activity, any matter which will either be in a solid, liquid or gaseous or any combination thereof. In other words, this definition provides a broader explanation that indicates that waste could be from different sources and in different forms but as long as it is considered

unwanted during its discharge. For purpose of this study, the abovementioned source will be shortened to only the "Minimum Requirements".

3.2.1 General Waste

General Waste is the type of waste that originates from residential household, office premises and educational institutions. General waste is normally viewed as an environmental friendly type of waste that includes issues such as papers, vegetable peels, foodstuffs and textile material in general. General waste is the type of waste, which is, according to the Minimum Requirements (1998: 3), not a threat to human health and the environment. In other words, it is the type of waste that is not hazardous and does not pose any significant threat to its collectors as well as the environment where it is supposed to be disposed off. The same will apply to the disposal area where such type of landfill site that has been classified as a general waste landfill site as specified inline with the provisions of the Environment Conservation Act (73 of 1989) where only general waste could be deposited.

There is a general misconception that general waste is only collected from residential household only whereas some forms of general waste emanate from offices in industrial blocks as well as from clinics, medical centers, and hospitals. It may be noted that while it is highly expected that waste collected from residential households will be pure general waste in the form of biodegradable materials, it was recently realized, according to Purdom and Anderson (1983:358), that the composition of waste or the waste stream even from residential household has changed due to the fact that too many activities such

as small scale servicing of vehicle currently takes place and eventually, some people tend to dump old or used oils down the sewer drain while during rainy days, oils spillages that occurred during the servicing of such vehicles, end up in the water stream thereby polluting the water. Some oil content are modified with much addictives to boost their durability and power which creates a more corrosive substance that creates more problems for the environment.

3.2.2 Hazardous Waste

Sources of waste could differ depending on their nature and content as well as place of origin. For example hazardous waste is type of waste that is normally toxic and is also contaminated with chemicals including other substances that are not friendly to both human lives and the environment. Their place of origin is linked with industrialization. In terms of the Minimum Requirements (1998:3) hazardous waste has been described as that type of waste that has the potential, even in low concentration, to have significant adverse effect on public health as well as to the environment because of its inherent toxicological, chemical and physical characteristics. In other words, hazardous waste is the type of waste that could put people's lives at risk. According to the Emfuleni Solid Waste By-Law (2005:3) hazardous waste has been described as any waste which, by reason of chemical reactivity or toxic explosive, corrosive or other characteristics, cause danger or are likely to cause danger to human health or the environment, when alone or in combination with other wastes.

In line with the above, Miller (2000:580) explains that the concept hazardous waste in the United States of America is legally defined as any discarded solid or liquid material that:

- Contains one or more than 39 toxic, carcinogen, mutagenic, or teratogenic compounds at levels that exceed established limits,
- Anything that catches fire easily such as petrol, paints and solvents,
- Is reactive or unstable enough to explode or release toxic fumes, and,
- Is capable of corroding metal containers such as tanks, drums and barrels.

The above definition clearly tally with the South African version which describes hazardous waste as any waste that directly or indirectly represents a threat to human health or to the environment by introducing one or more of the following risks: explosion or fire, infection, corrosion, reaction and damage to the environment (Kidd 1997: 141). In other words, all forms of legislation adopted by the government; aim to protect human beings from pollutants that could affect lives while such pollutants are expected not to pollute the environment as well. This explanation tends to qualify the importance of Section 24 of the Constitution of the Republic of South Africa Act, (Act 108 of 1996) which is intended to protect the environment from different pollutants and to preserve the environment for the future generation.

In a layman's language, hazardous waste could be simply referred to as a dangerous type of waste especially towards human survival. While it is noted that this type of waste is not generated amongst residential households, Fellman et al (1997:483) reiterated that the term hazardous is quite broad as it refers to all forms of waste including toxic ones that pose as an immediate long term human health risk towards a cleaner environment.

3.2.3 Agricultural waste

It is a common practice that food sources are cultivated from farms and are delivered from areas to city centers. Waste generated in these areas often emerge during the rearing or processing of animal products as well as during processing of crops for delivery to urban markets. Food crops such as cabbage could be delivered to the market complete with outer layers but with time, outer layers tend to wither and for the seller, withered leaves are cut out to ensure that the product could remain fresh. Apart from withered leaves that seemed to create a pollution problem, wrappers that were used during the transportation of such products to town, are as well, thrown away by the sellers as no longer desirable. In other words, the delivery of such products into town, tend to become a serious source of pollution that is experienced in many urban centers (Atkinson 1999: 169).

In other instances, agricultural waste played a major role when farmers fertilized their fields for additional planting. In the olden days, cattle manure was mainly used as a good commodity to fertilize arable land in order to produce better products. Currently majority of farmers have moved away from the old system into new in the sense that, instead of

importing excessive loads of fertilizers, some farmers resorted to compost strategies where agricultural waste from farms was used in the compost creation processes. A similar example was seen in the Durban area where it was attempted that sludge from the municipal network should be used to make compost as a method to dispose it. The idea could not be sustained because it was found that farmers had already created compost of their own from agricultural waste products they had and, they supplemented their compost with chemical fertilizers purchased from industrial suppliers (Davis & Freeman 2000:269)

In the agricultural fraternity, there is a common practice that all discarded agricultural by products including chuff from crops are ploughed into the ground before crop planting period could commence as a way of adding nutrients into the ground. In modern farms, volumes of wood that are cut or during the pruning of trees, are often chipped or cut into smaller pieces and then get spread onto the field before crop planting could start. Cunningham and Saigo (1999:516) reiterated that most of the agricultural wastes created or generated from farms are recycled into the soil where they are produced. These represent a valuable resource as ground cover to reduce erosion and become fertilizers to nourish new crops which constitute a single largest source of non-point air and water pollution in the country.

3.2.4 Construction Waste

Construction waste is also known as demolition waste or as builder's rubble. In terms of the provisions of the Solid Waste By- Laws as adopted by the Emfuleni Local Municipality

(2005:2) construction waste was defined as the type of waste generally consisting of inert materials such as builder's rubble, and bulky construction debris that are considered as an aesthetic problem rather than an environmental friendly ones. Construction waste is normally found during the construction of roads, houses and during the demolition of old buildings that need to make way for modern structures. During the demolition of buildings the type of waste available will include metal objects, broken bricks and hardened cement mortar. Companies employed to demolish buildings mostly remove valuable and recyclable materials such as door and window frames, corrugated irons including rafters and roof tiles before the building could actually be brought down. At times, a portion of payment or benefit to the demolition company is linked to the profit acquired by the demolition company after the sale of such recyclable materials. In other instances, the problem of acquiring virgin material could emerge and as a result, builder's rubble could be crushed and screened to produce sand that could be used for building while others could be used as aggregates for foundation filling, concrete, bricks and paving blocks (Ligneris 2000:289).

The usage of builder's rubble could differ from area to area. It may be noted that the contents of builder's rubble include a variety of items that could be used for plastering, building as well as for some filling during the construction of new structures. In Sedibeng District Municipality, residents are always encouraged to dispose builder's rubble from their houses in nearby mini-dumps established at the periphery of their residential areas. This is done because compaction vehicle utilized in the area are not compatible with that kind of waste. It may be noted that demolition waste is in the form of soil mixed with broken bricks and dried mortar that will require specialized tipper trucks to transport to the

landfill site. When such types of waste is deposited in a mini-dump, to the resident, it is quite a good move by the municipality to establish a facility next to the people that will make people pay less or almost nothing to dispose waste other than funds they used to spend in the transportation of the rubble to the desired disposal area. The transportation of builder's rubble to the landfill site is done by the municipality at no cost to the residents and during the shortage of daily cover material for waste deposited at the landfill site, the usage of builder's rubble as daily cover material for a landfill site is a viable option (Fuggle & Rabie 1992:495).

3.2.5 Medical Waste

Medical waste is also known as Healthcare waste. This type of waste is generated from healthcare centers, clinics and hospitals. In terms of the provisions of the Emfuleni Local Municipality Solid Waste By-Laws (2005:117) medical waste was defined as any waste generated by hospitals, clinics, nursing homes, doctor's offices, medical laboratories, research facilities and veterinarians which are infectious or potentially infectious. This concept was further defined in the same By-Law to include the following categories:

- Microbial waste that could cause infection,
- Human blood and blood products,
- Pathological waste of human origin such as severed human body parts,

- Contaminated animal waste including animal carcasses exposed to infectious agents during medical research,

- Isolation associated with animal or human beings known to be infected with highly communicable diseases, and

- Contaminated and uncontaminated sharps such as needles scalpels and broken glassware.

Forms of medical waste would almost be the same in the world but what is of importance is for each country to clearly define what constitutes waste and who manages such kind of waste. According to De Gray (2000:381) medical waste in the United Kingdom was defined as any waste which consists wholly or partly of human or animal tissue, blood or any other body fluids, excretions, drugs or other pharmaceutical products, swabs or dressings, or syringes, needles, which unless rendered safe, may prove hazardous to any person coming into contact with it. The above definition supports the decision by the South African government that general waste which mostly are in the forms of papers and some foodstuffs should be the responsibility of local municipalities as outlined in the Act (32/2000) and should be disposed of at the general landfill site while medical waste should be handled by specialized or private waste management companies and should be disposed of at hazardous landfill sites according to their ratings.

In simpler terms, medical waste may pose a threat to human health while general waste does not hence excessive waste recycling activties currently take place in general landfill

sites. This notion is so on the basis that waste generated from households is normally in the form of papers that could be used in their original form and plastic bags that are normally collected for manufacturing plastic holders and door mats that does not pose as hazardous to the workers collecting them while medical waste is collected in specialized containers that will ensure that the contents in the container, is sealed to prevent any contact with human beings. In other words, the handling of such type of waste is done in a professional way to ensure that provisions of Section 24 of the Constitution, (Act 108 of 1996), could be realized. In actual fact, the emphasis on the strict handling of medical waste is to ensure that any spillage or handling problem that could occur should not put human health at risk.

In the Sowetan Newspaper of 30 June 1995, a private company was contracted to medical centers to collect medical waste from their premises in a specialized closed body vehicle. Instead of delivering such medical waste to the relevant disposal site, the delivery van was found parked in a residential area with blood dripping from it. Based on the example, it could be found that the person responsible for the disposal of such a load of medical waste did not even understand the dangers associated with that type of waste. In similar situation, one could further find that such a contractor could be one of the fly-by-night service providers who is not trained to render the required and contracted services to the client (Jewaskiewitz 2000:415).

3.2.6 Bulky Waste

In terms of the Emfuleni Local Municipality Solid Waste By-Laws (2005:113), bulky waste refers to refuse generated on any premises but which by virtue of its mass, shape, size and quantity, cannot be removed with care without damage to the plastic liner. This could include issues such as tree stumps, tree branches, hedge stumps but exclude noxious waste. In the Sedibeng District Municipality for example, municipal waste compactors are only capable to pick up in the form of papers, plastics, textile material and some few fallen leaves refuse that are normally found in yards if they are collected and placed in a plastic bag. Bulky waste is found normally in areas such as mini-dumps, construction areas as well as demolition areas. Soon after the emergence of bulky waste, the producers need to ensure that the type of waste created is not going to be a nuisance for the municipality and in view of that, arrangements with the local municipality needs to be done for its immediate removal. It may be noted that the removal of bulky waste does not come cheap and should be done in line with the procedures that are practised by the operating municipality.

In terms of the Emfuleni By-Laws on Solid Waste (2005:121) a municipality could supply a bulky service in the form of bins normally used during renovations of buildings, with the aim that no waste should be thrown without control. Again, such a service is a pre-paid one and is paid according to the estimated volumes of waste that will be collected from that point.

Bulky waste refers to the type of waste that is disposed of at a specified place and it is mostly in bigger volumes. The question that may arise would be why municipalities entertain the idea of handling bulky waste that will require more resources for its removal? It may be noted that the majority of waste that is dumped in mini dumps around the Sedibeng District, is builder's or construction waste as well as garden refuse waste. If more and more waste of this nature could be generated in greater volumes, there is going to be a problem on the issue of landfill management as well as landfill airspace. To date, cities around South Africa are currently faced with a problem of land availability that could become suitable for the establishment of landfill sites. In other words, if municipal councils do not devise strategies that will help to reduce waste volumes to landfill sites, fewer land for the disposal of waste will soon run out for future operations. It may be noted that the Polokwane Declaration or commitment concerning waste management resolved that the usage of landfill sites as disposal sites for waste should not be seen as the only alternative. Instead, other options that could lead to the reduction of waste by year 2012 need to be explored. These sentiments were also adopted by Pikitup when they said that future trends for waste disposal were moving away from landfills to recycling, reuse and incineration of waste (van der Merwe 2004:21)

Technological advancement within municipalities could also help ease the burden of disposing bulky waste that could be found in waste transfer stations or mini-dumps, as they are commonly known in the Sedibeng District Municipality. According to the arrangements of running the affairs of mini-dumps, it will only be builder's rubble and garden refuse that could be disposed of in those areas while the rest of the waste is taken to the landfill site by municipal compactor trucks. It may be noted that green refuse

deposited in landfill end up being a source of raw material supply for existing composting gardens. To reduce the size of garden refuse deposited in a mini-dump before being transported to the landfill site or any relevant disposal area, a mobile wood chipper is brought to the area where all available tree branches will be chopped into smaller pieces and get loaded automatically into a truck for the compost area while builder's rubble will be collected later for use as a cover material at the landfill site (Smuts & Jackson 2002:315).

3.2.7 Industrial Waste

Industrial waste emerges from industries as an industrial by-product. These by-products are types of waste that are of no more use to a specific company. In other words, these types of waste by-products are actually useless for a certain company that releases them. By-products or residue from companies are always associated with negative impacts to either human lives or the environment. These forms of waste could either be in the form of dust, air and ash that could cause pollution. In support of the above, Purdom and Anderson (1983:358) view the term industrial waste as associated with worthless by-products which could include ash, slag and dust that could generate bad smell for areas in the same proximity. Further, some industrial solid wastes are quite toxic and hazardous and these include items such as drums that contained liquid waste chemicals and semi-liquid sludge. The author further state that dust from industries is yet another unpleasant and potentially harmful substance. These by-products could similarly be associated with mining activities where more dust particles come surface after mining excavations.

The creation of industrial waste as well as its disposal is linked to the process of industrialization. For a man on the street, it may not become a big issue for one to note that waste from industries is also disposed of in a general waste landfill site as one might not know the content of the waste at hand. In terms of the Minimum Requirements for Landfilling (1998) industrial waste could be disposed of in general landfill site if such waste is delisted in terms of the provisions of the Act. By delisting of the product by the government means that the product should first be declared harmless after some testing has been done on the by-product. Such type of waste could be disposed of in a general landfill site but if such a delisted by-product is in the liquid form, it could be treated by conventional primary and secondary processes that are used in municipal water reclamation centers (Purdom & Anderson 1983:313).

In the Sedibeng District municipality for example, the majority of industries operational processes bulk raw materials such as coal and iron ore that tend to leave the area with problems such as air and water pollution through dust and chemicals they emit into the atmosphere. Processes currently undertaken in the processing or manufacturing of products normally require a lot of coal to generate strong fires that could be used in the smelting of iron metals while some fires that are created are normally utilized in the generation of electricity at the Lethabo Power Station. In all these activities, volumes of water are required in the cooling down of machines. According to Purdom and Anderson (1982:315) industrial activities taking place in an area are seen as the normal industrial activities where people are able to get employment. People tend to overlook the fact that it is from these industries where a series of related problems are normally created

especially when excessive volumes of water to cool down the machines would be needed.

The problem behind water usage for machine cooling makes some water to come into contact with chemicals which are often washed into the main water course if they were not treated before being discharged hence cooling water ponds or dams are normally built behind many industries. In some other instances, water vapour from these machineries is released into the atmosphere thereby taking some invisible chemicals along with them. The building of cooling ponds or dams behind many existing industries is done inline with the provisions of the Water Act (Act 36 of 1998) where it was provided that water from all industries including backyards reservoirs or dams, should not be discharged into the main water stream before treatment on the water content is completed. This mechanism will ensure that no chemicals that are dissolved in the water will be released into the main water stream.

The content of the industrial waste tend to become problematic as one might not be able to determine whether the type of waste generated by a specific industry is contaminated with pollutants or not. Processes normally followed in manufacturing industries, is misleading when one observes steam evaporating from a cooling tower or a black smoke hovering in the sky. The majority of companies around the Sedibeng District Municipality are under constant watch from the government to ensure that they comply with emission standards set by the Air Quality of 2006. It is of importance for one to note that different types of industries emit different types of pollutants depending on the different sources of raw materials used as well as different types of products and by-products they have.

Authors such as Atkinson et al (1999:56) regard the burning of wood for fuel which is the main source of heat for poor people as something worsening pollution while smoke from vehicle and from industrial chimneys are seen as worst catalysts for air pollution.

It is common to note that almost all industrialized areas are linked to poor air quality and it is from these areas where respiratory diseases emanate. Industries emit a lot of smoke into the atmosphere and the government is aware of problems emanating from such areas hence, Acts of Parliament and a series of regulations have been adopted to ensure that the issue of pollution could be brought under control. In simpler terms, air pollution derives from the burning of coal for heat and power for the processing of raw materials in the manufacturing of products in order to ensure survival of kind (Detwyler 1971:95).

3.3 WASTE HANDLING AND STORAGE

The handling of waste by Sedibeng industries is an attempt to ensure that the Management of waste becomes controllable and does not go out of hand. It may be noted that in the early years of industrialization, volumes of waste that were then generated were minimal and did not warrant any special methods for their disposal. For industries close to rivers, some of the waste generated at their premises, were dispersed into the water while others opted to dump their waste at their backyards. It cost little for all of them to do that. In recent years, waste generated in other industries is no longer safe because they are contaminated with some chemicals. The concept waste handling seeks to address the manner in which different waste types should be handled. The rationale behind that is to ensure that the type of waste that is seen as dangerous like medical

waste or any waste that has been declared as hazardous, should be disposed of in the manner that no pollution to the environment or human health will be done. In other words, if hazardous waste could be improperly released into the environment as waste, they may contaminate the air, soil, surface water or ground water and may harm people and the ecosystem (Palmer 1998:51).

Waste handling is a process that is always followed by industries that generate hazardous waste to avert any accidental spillages to the surface. Such waste could be washed into the main watercourse during rainy day. In other instances, industries acquire the services of private waste management companies due to nature of services they have at their disposal. The idea behind these efforts is to ensure that provision of the Minimum Requirements for Waste Disposal by Landfill (1998), which is to prevent pollution, are adhered to as a measuring instrument to curb the pollution of the environment by pollutants from industrial effluents or landfill leachate. According to Liebenberg (2002:68) there is a need that adequate funds for the management of waste in industries should always be made available to avert pollution problem. Shortage of strategies for the management of waste in industries, are indicated by when unscrupulous fly-by-night waste management companies are hired as service providers. The appointment of shoddy service providers could result in some hazardous or dangerous waste found dumped at the backyard of many households including public open spaces that are not yet developed.

At times the content of the waste destined for disposal, could first require a series of strategies and procedures before they could be removed. There is a common practice

nowadays that waste handlers could mainly concentrate on the reduction of the waste volume to landfill sites through re-use and recycling as a method that will help save landfill airspace or the disposal capacity. This option could be useful for landfill sites accommodating general and delisted waste. In support of the above, Kidd (1997:140) reiterated that it is not all forms of waste that could be re-used or recycled; instead there are those types of waste whose residue needs to be safely disposed of as they could further create environmental problems.

Waste handling could be better analyzed, if it is to be a tool to protect the health of people from massive pollutants currently generated around the Sedibeng District Municipality. The importance of waste handling is an indication that the management of waste requires one to be cautious about the type of waste that is being handled as either toxic or dangerous to lives of the people or environment as outlined in the Minimum Requirements for Landfilling (1998:2). The need to handle hazardous waste in a proper and dignified manner by all generators, seek to address the following concerns:

- Ensure the correct identification and classification of hazardous waste,

- Keep hazardous waste from entering the environment illegally;

- Implement "cradle-to-grave" principles by means of planned waste management; and

- Control hazardous waste until it is safely disposed of by setting Minimum Requirements at crucial points in its management.

Waste handling goes hand in hand with waste storage. It is important for one to know what type of waste one is dealing with because different waste types would require different waste containers to ensure their proper disposal with regard to temperatures in places where such waste is stored temporarily as well as the transportation facilities for the removal to the relevant disposal site. In other words, there is a need for proper handling, collection, storage and transportation of hazardous waste as this will form the catalyst for pollution of the environment that needs to be averted in the management of waste which should be done inline with the provision of Section 20 of the Environment Conservation Act (Act 73 of 1998) together with the provisions of the Section 24 of the Constitution of the Republic of Africa Act, (Act 108 of 1996).

3.4 CLASSIFICATION OF WASTE

Several methods could be adopted in the classification of waste. These methods are quite complex and could differ according to the manner in which authors could interpret them. Fuggle and Rabie (1992:495) classify urban solid waste as follows:

- Inert wastes: builder's rubble and tyres and are not regarded as exerting a negative impact on the environment if disposed of properly;

- General waste: household, commercial and garden refuse. These wastes could exert a negative to the environment through leachate; and

- Special wastes: chemical, infectious waste that could cause health problems to people and these will be found mainly in medical centers.

Waste classification is an activity that is undertaken by a government department or an agency appointed by the government to help classify all types of waste that had been generated in the country in order to determine all dangers associated with them. The importance of waste classification, according to Simmons (1991:157) is to be able to give clue to the handler or the government what type of waste it is and how dangerous it could become to both the environment and human beings should any spillage occur.

The classification of waste is done to determine its place of origin, the dangers it could cause to both the environment and human lives. According to Kidd (1997:122) waste could be classified by means of:

- Source: which could include waste from domestic, industrial and agricultural areas;

- Form: waste in the form of solid, liquid or gas;

- Effects: waste that could be either harmful or harmless to human beings or to the environment.

It may be noted that landfill sites generate leachate once waste deposited in them could come into contact with rainwater. Such a substance is corrosive and should be handled with care. If during the construction of the landfill site, no preventative measures could be taken to control any leachate that will be generated in the long run, much damage would be anticipated to the landfill in question. Hazardous wastes are those types of waste that are always associated with health risk and their treatment after spillage would require specialist action that will help to stop pollutants from polluting the area. In terms of the Minimum Requirements for Waste Disposal by Landfill (1998:5), there is a need that the identification and classification of dangerous goods and substances should be done as a way or system that could be utilized to classify hazardous substances for transport purposes. Hazardous substances are normally given an identification number and are divided into nine classes for that purpose:

- Class 1. Explosives
- Class 2. Gases
- Class 3. Flammable liquids
- Class 4. Flammable solids
- Class 5. Oxidising substances and organic peroxides
- Class 6. Toxic and infectious substances
- Class 7. Radioactive substances
- Class 8. Corrosives
- Class 9. Other miscellaneous substances.

Despite the above classification, hazardous waste should further undergo some additional rating in order to ensure that the toxicity level of the waste in question or residue remaining after treatment must be determined before disposal. Hazardous rating indicates the degree of hazard as well as the class of hazardous landfill site at which such a waste could be disposed of. Hazard rating according to the Minimum Requirements for Landfilling are classified as follows:

- Hazard Rating 1. Extreme risk: disposal at H:H landfill faciiity;
- Hazard Rating 2. High risk: disposal at H:H landfill site;
- Hazard Rating 3. Moderate risk: disposal at H:H or H:h landfill site; and
- Hazard Rating 4. Low risk: disposal at H:H or H:h landfill site.

Classification of landfill sites seek to control the disposal of different waste types to be deposited into a suitable landfill site because there are waste types that have hazardous potential that, even in low concentration, they could still have an adverse effect on human health and the environment. Waste classification processes in South Africa, is currently controlled by the Department of Water Affairs and Forestry (DWAF) and the Gauteng Department of Agriculture, Conservation and Environment (GDACE). Landfill sites classification in South Africa according to Meyer (2006:40), is a classification system that is based on three parameters, namely waste type, size of operation and site water balance to ensure that the disposal of waste at hand is done inline with their toxicity level so as to prevent chemicals including leachate, from polluting the environment and the underground water-table.

3.5 WASTE INFORMATION SYSTEM (WIS)

South Africa as a developing country is seen as a country full of opportunities. There is currently a serious influx of people into South Africa's urban areas by people from all over the world with the hope to make a better living. Flooding of people into an area, come with a price. In some sections of the municipality, problems of emerging squatter camps are prevalent while in others, problems of poverty, hunger and crime are on the increase. It is normally a fact that when too many people converge into a single residential area, environmental health problem often results. The Sedibeng District Municipality is an industrial hub of the Gauteng Province and as a result environmental problems emanating from the densely populated areas especially squatter camps emerge and these areas are always linked with uncontrolled industrialization processes. In the State of Environmental Report adopted by the Gauteng Department of Agriculture, Conservation and Environment (GDACE) (2004:40) it was reported that the past growth in the industrial or manufacturing sector has resulted in increased release of discharges and emissions, with a consequent negative impact onto the air, water and land resources of the province.

The emergence of a series of problems related to environmental pollution as caused by both individuals and by industries has resulted in the change of strategies towards the handling and management of waste. During November 2003, GDACE introduced what was called the Waste Information System (WIS) where it was resolved that all companies operational within the borders of the Republic of South Africa, should register with the government to ensure that the products they manufacture, could become known to the government. This directive further required that each company should further register the

type of by-products they generate, their emission level as well as the handling and disposal techniques they apply in the disposal of the by-products. The rationale behind the registration of industries and their products was adopted as a measuring tool by the government to know and assess the dangers associated with industrial activities taking place in the area and also as a tool that could be used to ensure compliance with regard to legislation (Furter 2004:17).

Another objective for the registration of industries by the government was based on the fact that the government will have a whole picture of what is happening in a given industry and how serious is the problem they might be creating during the manufacturing of products and for purposes of inspection. Through industrialization, jobs are created. There is a need to ensure that the processes that are followed during the manufacturing of products should be of such a nature that pollution should be minimal because the move to create jobs does not override the provisions of the Constitution of the country.

Basically, the introduction of the Waste Information System was done in recognition of the provisions of the National Waste Management Strategy (NWMS) that seek to address issues around causes of pollution, identification of waste generators, transporters and disposers. In other words, the concern that led to the drafting of the NWMS document was not about general waste that was generated from different households but types of waste generated from industries that could come into contact with chemicals and healthcare waste medical centers, clinics and hospitals that could become hazardous to human lives. According to Furter (2005:5) Waste Information System was adopted initially as a strategy that was to be used to monitor types of waste that are rated as highly

dangerous for human beings as these strategies were to ensure that recycling was to support other components of the NWMS which include issues such as capacity building and data co-ordination that will further ensure that data from all waste streams would also be recorded.

The introduction of the Waste Information System in South Africa, seeks to address problems that are caused by different waste types from different sources. There is a clear indication that different forms of waste could lead to different environmental problems in the long run if they were not handled properly as expected. For example, leachate that is generated in landfill site when waste come into contact with rain water, could cause serious water pollution at a later stage if precautionary measures for their control could not be put into place. In the United States of America, the generation of waste in greater volumes made the government to pass two federal laws that were to regulate the management of hazardous waste and their disposal. During 1976 it was required from all waste generators to provide a comprehensive programme that requires "cradle to grave" record keeping, processes followed in the management of toxic as well as the implementation of strategies utilized in handling hazardous substances. It was further required that there should be a complete set of rules that require generators, shippers, users and disposers of these materials to keep meticulous account of everything they handle with regard to toxic or hazardous waste and they need to record the whole process as to what happened to it (Cunningham & Saigo 1999:526).

The need to adopt stringent measures that require the registration of industries, their products and by-products was based on the fact that toxic and other hazardous waste were being generated around the world at an alarming rate and as a result it became a problem when some discarded wastes could no longer be accounted for. According to the Environmental Data Report (1993:329) the move for the registration of industries and their activities was also caused by the fact that there was a lack of reliable statistics describing the generation, treatment and disposal of waste. This emanated from the fact that some countries have gone to an extent of exporting waste to countries with less stringent waste control measures that had lower public awareness and lack of knowledge on the dangers associated with the type of waste received.

In view of the above, the South African Government promulgated the National Environmental Management: Waste Bill during 2006 wherein its Section 61 outlined the objectives of the Waste Information System as follows:

- A. Store, verify, analyze, evaluate and provide data and information for the protection of the environment and management of waste;

- B. Provide information for the development and implementation of any integrated waste management plan required in terms of this Act; and

- C. Provide information to organs of the state and the public:

  (1) for education, awareness arising, research and development processes;

(2) for planning, including prioritization of regulatory, waste minimization and other initiatives;

(3) for obligations to report in terms of any legislation; for public safety management;

(4) on the status of the generation, collection, reduction, re-use, recycling and recovery, transportation, treatment and disposal of waste; and

(5) the impact of waste on health and the environment.

It may be noted that the need to have all the information about existing industries dates back to the times when operational industries that were situated next to each other started blaming each other during the analyzing of water samples from their industries by the responsible government department. According to Wates and Bredenhann (2002:335) waste management depended *inter alia,* on access to information on the generation and disposal of waste and this action would require the registration of all waste generators, a waste tracking system and statutory submission of information to the government for the regulation of such processes.

3.6 WASTE DISPOSAL OPTIONS

Methods for the disposal of waste vary with time and they also depend on the area where they are applied. In the Sedibeng District for example, some of existing landfill sites were

originally used as backyard dumping places like the Boitshepi Landfill site. Similarly, Fellman et al (1997:481) indicated that in the earlier period of industrialization, areas used as waste disposal sites, were simply open dumps on undeveloped pieces of land. The increase in the amount of waste generated and deposited at those areas resulted in negative aesthetic conditions that became uncontrolled waste and became a cause of many illnesses. To avoid similar problems, new methods on sanitary landfill had to be adopted which ensure that waste deposited in a landfill site should each day be placed in a cell and be compacted and thereafter be covered with a layer of soil.

3.6.1 Sanitary Landfill

In terms of the provisions of Section 20 of the Environment Conservation Act of 1989, waste can only be deposited in landfill that has been established as outlined in the Act. In other words, landfill sites are to be established based on statutory requirements, to ensure compliance with the provisions of the above legal requirement, which require that all forms of waste collected should be buried under the layer of soil. Purdom and Anderson (1983:365) view the concept sanitary landfill as something that involves the deposition of waste or refuse in a low place or a trench excavated for that purpose and thereafter, the deposited waste is compacted and then covered with soil.

The need to establish a landfill site is aimed at the protection of lives, which is a constitutional obligation that should be undertaken by all municipalities to ensure all people reside in a cleaner environment. According to Keller (1984:294) a sanitary landfill site as defined by American Society of Civil Engineering refers to a method of solid waste

disposal that function without creating a nuisance or hazard to public health or safety. The waste deposited is compacted and gets covered to effectively deny continued access to the deposited waste by insects, rodents, and other vermin as well as to protect waste from rain water and sun to prevent Methane gas formation.

It may be noted that the majority of waste collected from different household are deemed to be non-toxic and are deposited in a general landfill (GSB, GLB, GMB) site while waste from clinics and hospitals and waste from some industries are deposited in hazardous landfill site (H:h, H:H) At times, general waste from different households is deposited into hazardous landfill sites in order to neutralize their toxicity level

Landfill sites are normally associated with smell from rotten foodstuffs. Smell from all sources, has to be avoided to protect operators as well as waste reclaimers that salvage for recyclable materials. The issue of waste management is not just a matter of dumping waste in a landfill but also includes issues such as the protection of the water table from the landfill leachate that could be created if excessive amount of water can pass through the collected waste hence, the usage of clay layer or impermeable under-liners during the construction of landfill cells became a necessity (Cunningham & Saigo 1999:526).

The problem currently haunting Sedibeng District is not a new one and include issues such as, land shortage for landfill development as many of them were almost reaching their full lifecycle as well as the non-availability of licenses or permits for operating them. Erhlich and Erhlich (1972:159) have shown in their report that many cities in the United States of America are faced with waste disposal crisis due to the problem of population

increase that have resulted ultimately in the generation of too much waste and ultimately, land that could be made available for the purpose had become a scarce commodity. In a workshop held by the Gauteng Department of Agriculture on 3 May 2004, Dr Rama, the then Director General of the Department of Agriculture and Conservation and Environment of the Gauteng Provincial Government, warned that municipalities around Gauteng should come up with new ways and means that should be utilized by residents to reduce the volumes of waste from reaching the landfill site because the department was not in a position to authorize the development of a new landfill site in the near future.

It is not surprising for one to note that all existing landfill sites had their different ways of development because they were not established in the same area and at the same time. Since the passing of the Environment Conservation Act of 1989, the development of a new landfill site was subjected to a series of Environmental Impact Assessment (EIA) processes to ensure that the geo-technical report for any piece of land that could be made available for the development of a new landfill site should be made available. This action will ensure that environmental dangers that result due to the establishment of a landfill site could be averted.

The Sedibeng District Municipality is situated in an area where a series of mining activities took place due to the abundance of tons of coal underneath as well as sand that could be used in the construction of buildings. Immediately after the excavation of these minerals some of the topsoil that were removed, were never replaced and as a result, borrow-pits and quarries were created. Borrow-pits or quarries are those areas created by owners of land in search for soil or stones. In view of this Nguta (1996:359) concluded

that some landfill sites are normally abandoned quarries, mining dumps or other low value land in the periphery of the town or residential area. The unfortunate part of this matter is that these sites are often chosen without proper consideration of issues such as geological and hydro-geological suitability. In other words, any danger or problem that could be caused during the decomposition of such waste such as leachate, can easily reach the underground water table as the disposal site, was not lined properly to prevent any form of pollution.

The term borrow-pits as interpreted by Detwyler (1976:349), is similar to an open pit, which is amplified by quarries producing sand, limestone, sandstone, marble and gravel. It is unfortunate that once the intended purpose of the quarry is completed, the quarry remain unclosed and unattended to and eventually, these areas become water ponds like the diamond hole of Kimberly which has now been turned into a tourist attraction point or a death trap.

In line with the picture below, other horrible pictures explaining similar situation were taken, all of which showed a desperate situation faced by waste reclaimers in landfill sites. In sum, this picture is just a tip of the iceberg as more items of a similar nature could have been taken out of the landfill site without the knowledge of the operating officials. For example, the picture below was taken some minutes before one of the waste reclaimers could take home for consumption. The picture shows a piece of meat that was almost in a decomposed stage that is not suitable for consumption.

Figure 3.*1 A piece of meat at the Palmsprings Landfill Site collected for consumption*

Atkinson (1999:166) reiterated that if waste could be kept unattended like in open dumps, it will attract army of stray animals, pests, vermin and birds all of which would infect people. In view of the above, neighbours within the same environment used the traditional method of setting fire to partly dry garbage heaps in order to control these infestation and to avoid any foul smells likely to emanate from fermenting substances.

In the following picture, a desperate and hungry young man from nearby Evaton West went to Palmsprings landfill site to feed himself. Due to the attention he received from the delegation of the twinning municipality of Eindhoven from the Netherlands, he started to hide his "palatable" packet of food under the paper in front of him fearing that those onlookers will deprive him of his ration for the day.

Figure3.2. A hungry waste reclaimer hiding a packet of condemned food from the Eindhoven municipal delegation in the Netherlands

3.6.2. On-site Disposal

On-site disposal technique could be seen as an easy and cheap method as no financial burden will be felt during the disposal of that waste. Depending on the area where such a method is practised, all manufacturing industries around the Sedibeng District have backyards for storage of raw material as well as an area to dispose by-products and for packaging products. By-products from these industries are often stock-pilled nearby for possible disposal. Around these industries currently, it is mainly ash and slag that seem to constitute a pile of by-product. A closer look at the backyard of industries such as Mittal, Cape Gate, Rand Water, Sasol and Lethabo Power Station for example, will indicate mountains of ashes. In a situation such as this, one could start to doubt the rationale behind the dumping created at their backyard on whether it was based on the issue of land availability or was it directed at cost savings. This is because it has become evident that the issue of population increase has affected the sizes of land that could be made available for major industries. The same applies to the availability of land that could be allocated to municipality for waste disposal purposes (Ehrlich & Ehrlich 1972:159).

What poses a problem currently with industries was never anticipated and the dangers that are now seen as associated with ash dumps were also not anticipated hence, no precautionary measures were taken into account. The concept of "dilute and disperse" was adequate for the disposal of waste from an industry. Further, industries that were situated near main river course used water from such rivers for processing and cooling products. At the same time, most of the loose waste attached to the product to be cleaned, got washed into the main river thereby polluting the water (Keller 1984:540).

If on-site dumping for a company cannot have negative results like hampering production or creating nuisance, then the industry in question benefited. As soon as a new need could arise that would like to see the said dump removed for some other reasons that could include corrections or extensions of the same industry, then the industry has not benefited. Funding for the removal of waste from industries have increased to ensure that the process does comply with provisions of the Act. A different scenario was created in Germany when different forms of wastes were gathered together to construct special forms of environment. For example, the city of Munich in Germany, built a mountain of trash out of World War 2 rubble and then covered a whole area with soil and, what is called "Mt. Trashmore", is now a park and also a monument to war victims (Foin jnr 1976:339).

Shorten (1998:40) on the other hand, had a strong belief that by way of disposing wet waste down the drain, waste volumes to the landfill site would be reduced and further, such a method will help in the reduction of kerbside and commercial refuse collection. The issue regarding on-site disposal can carry both positive and negative results for a company but for one such as Mittal (ISCOR) in Vanderbijlpark, the opposite was the case. Feris (2000:8) reported that there was absolute glee and bitter resentment to people living next to Mittal when the company started to buy out people from their properties because of underground water pollution in their properties. Should they have known (Mittal) of the time bomb they were sitting on about this on-site dumping that developed in the early 1900`s, measures to curb this type of a problem could have been put in place.

On-site disposal is an acceptable mechanism that has been in use for some years around existing industries. In terms of the Emfuleni By-Laws on Waste Disposal activities (2005:22), any person occupying premises in an unplanned, informal residential area or any area which does not receive collection services, may dispose of waste materials in dug earth pits or borrow area, which must be covered on periodic basis. It was further provided that no persons should dispose or place waste in drainage ways, streams or lakes as a method for its disposal. In other words, on-site disposal is a temporary measure that is always adopted by affected parties or waste generators as an immediate solution to avert the effects of waste towards lives and the environment. On-site disposal sites are not open for public use but for a private company hence they are fenced off from users.

3.6.3. Waste Transfer

The concept waste transfer or transportation has to do with the movement of waste from the source to its disposal area. Various methods could be employed to ensure that this objective is able to get off the ground. The type or methods of transporting waste in municipalities may differ from based on their financial stability. The method to be employed by a specific municipality, will determine the type of vehicle to be used as well as the type of receptacles compatible with the vehicle. According to Bell et al (2002:55), there has been a common practice adopted historically in South Africa that saw hazardous waste management being undertaken predominantly by private waste management companies while general waste, which is regulated in terms of Schedule 5

of the Constitution of the Republic of South Africa, (Act 108 of 1996) is seen as the sole responsibility of the waste management division of a municipality.

In South Africa, there are too many companies that transport waste bins to and from landfill sites carrying either general or hazardous waste. The potential problem is whether the companies that undertake such functions to comply with the provisions of the Act that regulates the management of waste. It is of importance to note that waste management functions need to be provided based on the provisions of the Municipal Systems Act, (Act 32 of 2000). The provisions mentioned above do not specify whether municipalities will only handle and look into the affairs of general waste other than hazardous waste because there is a need for municipalities to determine how safe the environment is from different pollutants.

In the Sedibeng District Municipality for example, waste is normally transported or collected from different households and industries to different landfill sites existing within the area of its jurisdiction. Increases in households have increased the volumes of wastes that are collected. The same has also applied to the knock-off time for workers that has also, been extended. In some parts of the Sedibeng District, there are no landfill sites available which could be a result of shortage of land suitable for the establishment of a landfill site. For example, the Sonlandpark landfill site was closed in the middle of the 1980`s and a mini-dump or transfer station was introduced for waste to be transferred to the Waldrift landfill site. In areas such as Heidelberg in the Lesedi Local municipality, a multi waste transfer station operated by Waste Group was established near Ratanda because there was no landfill site in that area.

Modalities of transporting waste may differ from municipality to municipality as well as type and nature of waste at hand. The commonest methods towards waste transportation around the Sedibeng District Municipality were adopted based on the provisions stipulated on Part A and B of Schedule 4 and 5 in the Constitution of the Republic of South Act (Act 108 of 1996). Basic waste management functions of a waste management division of a municipality normally do the following:

- Bin service – this type of service is employed to address bulk waste service that is mostly required in industries, schools, business complex and construction services during the demolitions of buildings. These bins are either collected on scheduled days or the service provider gets a call from the client to collect them. In the Emfuleni Local Municipality for example, such a service has been outsourced to a private company and the remaining bins are utilized in the four mini-dumps at the Vereeniging area,

- House-to-House compactor service – this type of service is rendered to all households within the Sedibeng District by means of Rear-End-Loaders (REL) compaction trucks. These compactors are mainly allocated to fully developed areas where there is proper road network. There is a common practice in the Emfuleni solid waste division whereby double axle compaction trucks are allocated to town areas while single axle compactors are allocated to previously disadvantaged areas because of narrow streets for double axle trucks to turn. The same service is extended to the environmental division of the municipality where

the Environmental Health Officers are involved in condemning rotten foodstuffs from shops which, unfortunately, end up in unprotected landfill site where they get collected by waste reclaimer for use,

- Tractor and Trailer service – this type of service was meant for areas such as Evaton and some agricultural areas that could not be reached by compactor services,

- Flat-back business service – this type of service is aimed at servicing some shops whereby municipal workers are expected to pack cardboards in the flat-back truck that cannot fit into a compactor truck for disposal,

- Tipper Trucks and Front End Loader service – this type of service seeks to address issues related to illegal dumping in a manner that will ensure that sufficient soil or cover materials become available for landfill sites.

- To provide pre-paid refuse removal service such the removal of builder's rubble to residents who do not have means of removing such bulk waste from their homes at a price, and

- Mini-dump or waste transfer station service. These are temporary waste disposal sites that are used mainly for garden waste or refuse as well as builder's rubble from all household within an area. In other words, these structures are meant to harbour waste that is collected for final disposal else. The waste transfer station in

Heidelberg is different from mini-dumps of Vereeniging because the former caters for all forms of general waste and the latter caters only for the greens and builders rubble.

It may be noted that the Sedibeng municipality is a district and comprises local municipalities. As a result, the Sedibeng District Municipality would have to perform all functions identified in Part A and B of both Schedule 4 and 5 as stipulated in the Constitution of the Republic of South Africa Act (Act 108 of 1996).

According to MacFarlane (2002:76) there is a need to establish mini-dumps or waste transfer stations close to residential areas because the idea behind the design of waste transfer stations were that they provided an efficient transfer system which could accommodate high peak volumes of variable waste system. In addition, such stations have provided a convenient, hygienic and safe off-loading facility for both the general public and municipal workers. It is unfortunate that waste volumes from these facilities will never be reduced because no form of waste recycling is allowed in those premises.

3.6.4. Waste Exchange

The concept waste exchange in South Africa has not been in use for long. Existing industries relied heavily on readily available natural resources and other relevant materials. This trend soon became a victim of uncontrolled urbanization whereby quantities of natural or raw materials began to shrink. Each company had adequate sources of supply of raw materials that affected their prices. In an Environmental Data

Report (1993:342) tabled before the United Nation Organisation (UNO), it was stated that waste exchange schemes offer service to industries that will enable a variety of wastes including residues, to be used by another industry as a secondary material. In other words, it was no longer true that the say "one man's meat is another man's poison" could be valid as industries around the Sedibeng District are dependent on by-products or residues from other companies. Many companies around the Sedibeng District Municipality use coal and the by-product of coal, as ash. The ash is sold to companies such as JJ Bricks, Delta Bricks and Vaal Bricks to be utilized in manufacturing bricks.

Similarly, the waste exchange notion is actually not to remove waste from a specific company as was in use by companies such as Rand Water in Vereeniging. In other words, the process of exchanging waste between companies helps to clean their areas on the one hand and to generate income on the other. Ultimately, there will be lesser waste to be sent to the landfill site for disposal. In companies where steel is manufactured such as Cape Gate, a combination of ash and slag is mostly found and as a result, waste reclaimers on site collect such slag at the Boitshepi Landfill site for a living.

While waste exchange is a key component towards waste disposal of unwanted by-products or residues from company premises, the concept seems to address issues related to waste minimization. Manufacturing industries in the country are currently faced with waste disposal problem as required by the provisions of National Environment Management Act (NEMA), Act 8 of 2004. According to this Act, industries and factories must take full responsibility for managing their own waste stream to ensure that waste does not become a problem to the environment. It has become a trend nowadays that

industries have gone to an extent of outsourcing waste disposal activities to private companies or private individuals who have the capacity.

According to Neethling et al (2006:743), a concern towards the usage of the name Waste Exchange was raised by people in industries that saw the importance of using by-products from neighbouring industries. They reckon that they would rather prefer to use other names such as "material exchange or by-product exchange" other than the term waste exchange. The rationale behind the proposals of such name differences is in line with the drive towards cleaner production where material only becomes waste when no other use for such material can be identified both internally and externally. The authors further stated that a number of companies around the Sedibeng District Municipality are willing to participate in the programme on condition of confidentiality on their *modus operandi*. They further resolved the following to form part of the programme:

- The waste offered for exchange be called "material on offer for exchange" and that the model be jointly owned by the industries and the authorities,

- A small team of experts manage the model and that all parties involved in the programme should support behind the adopted model, and

- The system be operated as a confidential brokerage approach or alternatively, as a form of subscription by participating parties.

The term industrial waste exchange is quite new and it has emerged as a result of problems experienced in the private sector especially amongst manufacturing industries. Dittke and Novella (2001:21) explain Integrated Waste Exchange (IWEX) as an internationally recognized waste reduction concept, which has its initial roots somewhere between recycling and reuse. This concept is based on the premise that trash from one business is a treasure or virgin material for livelihood for another business. The adoption of IWEX is still not seen as an advantage to majority of people, but the initial objective of municipalities which is the reduction of waste volumes to the landfill site, has been virtually realized due to the involvement of their officials with other industries, in the project.

The Waste Exchange activity is normally possible to implement in industries that are almost in the same proximity where transportation cost is minimal. By-products from different industries may become remedial to the survival of the other. According to Andrew and Jackson (1996:335), an alternative approach to dispose waste is to use waste from one process as a feedstock for another. In some instances waste from other process can be used to treat the waste from another. To qualify the above, authors gave an example that prior to painting or electroplating, the oxide coat on steel is removed by using acidic pickling liquors. Once spent, these may be reused as precipitating agents, removing phosphate from wastewaters.

The rationale behind industrial waste exchange is to focus more towards waste minimization. This was as a result that much waste was reaching landfill sites at a tremendous rate and as a result a new problem of air space availability has recently

surfaced in landfill sites. In the Cape Town municipality for example, a website on Integrated Waste Exchange was launched in May 2000 in an attempt to reduce the volumes of hazardous and general waste from reaching the landfill site. To them Integrated Waste Exchange (IWEX) refers to the following:

- IWEX is a free service for all South African businesses – matching "waste material generators" to "waste material users"

- IWEX lists material requests/offers on the IWEX cataloque via a listing form

- IWEX is a clever money and resource saving "waste management tool"

- IWEX can turn fixed costs for disposal, transport, materials and storage into savings
- IWEX conserves energy, resources and landfill airspace.

(McDillion 2004:630).

Basically, the concept waste exchange is self-explanatory even though a need could arise that data on the number of existing industries, their products and by-products should be made known to all stakeholders or to those that are willing to participate in the programme. Waste exchange schemes, according to Environmental Data Report (1993:342) offers a service to industries which enables a variety of waste or residues to be used by another industry as secondary raw material while the collected data become

useful in informing potential industries of the availability of useful waste where no well developed commercial recycling infrastructure existed.

3.6.5 Waste Incineration

Several reasons could be given why waste is supposed to be burnt or incinerated. Reasons may vary based on where they originate and also on the type of waste at hand. According to Keller (1996:335) incineration of waste is considered to be a disposal method because the hazardous waste is not disposed off directly, instead it undergoes a treatment process that produces ashes, to be deposited in a landfill site.

A new problem that creates problems for municipalities is shortage of suitable land for waste disposal. Some wastes are seen strewn all over an area when they do not reach the required disposal site due to non co-operation by some members of the community who continue to dump illegally even at night, and is often collected by affected households and burnt as a process of cleaning the area. According to Cunningham and Saigo (1999:519), waste incineration also focuses on the reduction of waste volumes. The impact for the volume reduction is good enough for areas with landfill problems because responsible municipalities will be required to spend lesser funds for disposal of waste.

In some instances, waste is burnt as raw material in the production of certain commodities. It may be noted that the rationale behind the burning of waste may differ from area to area. According to Fellman et al (1997:481) the main objective of waste

incineration is to convert waste into energy whereby through burning refuse, steam or electricity is produced and as a result, lesser money will be spent on the acquisition of burning of raw material or rubbish that would be needed to sustain a project. For waste reclaimers, burning of waste is a normal procedure in order to acquire recyclable products. For example, waste reclaimers burn electrical cables to obtain covered copper wires.

Shortages in the acquisition of virgin material have led some companies into changing their source of raw material supply. The movement for changing the type or source of material to be used was also backed by authors such as Andrew and Jackson (1996:330) when they reiterated that some companies started to utilize waste and old tyres to burn cement kilns as source of heat while wires from such burnt tyres were collected as scrap metal for recycling. The advantage for companies to use waste as a secondary or raw material is concomitant with the fact that while the other by-product material that will be yielded in the process will be reduced through recycling, the ash becomes integrated with other products thereby obviating the need for its disposal.

In European countries, central heating is mainly done to ensure that all residents are protected from such harsh colds. Through the burning of waste, authorities in Netherlands were able to supply residents with hot water and the vapour, which would be utilized in the manufacturing of other commodities. While the volumes of waste to be disposed of at the landfill site will be greatly reduced, savings to be benefited by the responsible municipality or by waste management company responsible would enormous (Cunningham & Saigo 1999:519). Waste incineration may appear simple when one looks

at the advantages of reducing waste and the ability to obtain hot water. Waste incineration however, is always associated with the problem of air pollution. In view of the above, Lombard (2002:11) concluded that waste incineration could pollute the air and subsequently, the surrounding land and consequently the ground water through inadequate incinerator design and bad control process.

What is common today is that many cities are faced with disposal problems due to population increase, which generates waste at a faster rate than what operating authorities could handle and at the end, lesser space is made available for the establishment of a new landfill site. According to Purdom and Anderson (1982:367) the management of waste in places where there will be a need to haul refuse to long distances where land prices for the establishment of a disposal site will be high for the municipality, will require that all the accumulated waste to be incinerated in order to reduce the cost of carrying such excessive waste volumes.

There is a common practice that waste gets incinerated as a way of getting rid of foul smell. Animals along main roads often get killed and because of heat, the process of decomposition takes place speedily. In such a situation, workers often burn the remains of such animal carcasses. The reduction of waste volume can be achieved through the burning of waste and then the residue is manually compacted while the burning of putrescible waste helps to control odours and pests on a small scale. Basically, the principle of burning rotten waste or carcasses is as old as mankind itself because all bacteria causing the smell will be burnt up in the fire or incinerator thereby removing the smell (Fuggle & Rabie 1992:499).

It may be noted that different waste types would require different waste strategies to ensure their proper cleaning. In the Sedibeng District Municipality for example, local municipalities, are only authorized in terms of the provisions of the Local Government: Municipal Systems Act (Act 32 of 2000) to collect general waste while hazardous waste is to be handled by specialized private waste management companies. In terms of the Minimum Requirements for Waste Disposal by Landfill (1998:9) there is a general consensus that incineration of waste is the most preferred methods for the disposal of most organic and selected inorganic hazardous waste and the same applies to an area where such two types of waste would have to be landfilled or buried. Currently general waste is deposited in landfill sites established within the Sedibeng District while hazardous waste is deposited at the Holfontein landfill site next to Springs in the Ekurhuleni Metropolitan municipality.

3.6.6 Mini dump facilities

Mini dump facilities are similar to waste transfer facilities but on a small scale. The Sedibeng District Municipality is increasing in size each day with regard to the provision of household waste. Requests to provide more waste management services are always echoed every time as soon as blocks of new houses are completed. Contrary, lesser spaces were made available for the construction of waste disposal facilities. Mini dump facilities are areas constructed by a municipality for the disposal of garden and bulky waste and according to the Emfuleni Local Municipality's By-Laws (2005:16) builder's

rubble may be disposed of at the mini disposal sites which are mini dumps, with light vans or trailers not exceeding one ton or loads determined by the municipality.

Facilities such as those mentioned above, are just but few and are mainly found around Vereeniging. According to Poswa (2002:102) there is a need that waste managers should continually seek alternative solutions to improve the quality of service delivery and they should further need to be proactive and admit that there will always be tight resources, limited competencies and ever increasing demands to harness waste management functions. If these facilities aim to address bulky waste problems for local residents, what will the situation be in areas where no such facilities existed? Will the communities disposing builder's rubble not far from their household be charged when doing so as there will be no mini dump nearby?

There is a common belief that people do not want to see waste dumped at their backyard. The question is where are people expected to dump their builder's rubble seeing such types of waste is not compatible with Rear End loader trucks and such waste is normally rejected during the household waste collection routine done by municipal workers. This is quite a challenge. According to Morkel (2000:127) dumping of waste illegally is a punishable offence and as a result offenders are always given a fine. These actions have only limited success because the council would have to spend thousands of rands to clear the dumped material.

3.6.7 Street sweeping and litter picking services

Street sweeping services form part of the core function of the waste management division of a municipality that are performed by municipal workers. The functions are normally allocated to town centers while litter picking function are allocated outside town centers and mainly along main routes and public open spaces. The rationale behind street sweeping is to allocate a dedicated team of workers to daily cleaning of the town area. It may be noted that town areas have daily business activities that generate a lot of waste at the end of each business day and as a rule, waste generated in a specific day, should be removed by municipal workers. Waste generated in town centers or in business routes, should be collected each day as part of the daily municipal routine and then be diposed of at the relevant waste disposal site (Wise & Armitage 2002:116).

Municipalities are custodians of a cleaner environment and as a result, care should be taken that to promote a healthy environment, some form of cleaning service must be immediately made available. Similarly, litter picking services are normally allocated to places such as parks, boulevards and waste hotspots where illegal dumping of waste is normally done after hours. It is normally found that the types of waste collected along the main roads include waste that has been thrown out of moving vehicles whilst other forms of waste is wind blown. Atkinson et al (1999:167) highlighted that quite often, many people throw garbage bags out of vehicles into containers or receptacles placed by municipalities to reduce waste volumes on streets. Many tmes, these people miss the receptacle and, bags of waste will liter the surrounding environment. At times bags get

ruptured due to weight and the contents get spilled out thereby creating unnecessary problems for the municipality to clean.

To a layman, the emergence of illegal dumps next to main roads or streets corners is often associated with lack of service or poor collection of waste in a given area. In view of the above, there was a belief that wealthier communities tend to be throw – away – societies whilst the poor ones have less to throw away and are more inclined to reuse and refurbish articles that a wealthier community discard. Some members of the community tend to believe that as soon as more waste was created, more jobs would have to be made available by the municipality in order to solve the problem but this idea could not be sustained as waste created became a health hazard to nearby residents (Poswa 2002:105).

3.7 CONCLUSION

In this chapter, the idea was to look into the different waste management strategies as adopted by the government to keep an eye on various forms of waste that are generated within the country. Some forms of waste generated could have a disastrous impact on the lives of human beings as well as the environment. It was also argued that there is a need for the government to know the various forms of waste that are created within the country, the dangers that could be associated with them if they could be disposed of wrongly. In other words, all sources waste need to be known to the authorities for corrective action.

Registration of waste, especially hazardous waste, is of importance because different forms of waste will require different disposal methods due to their nature and content as well as the area where they are supposed to be disposed of. Mention was made of the fact that landfill sites around the Sedibeng District Municipality are only capable of handling the general waste while the hazardous waste is handled outside the borders of the Sedibeng District Municipality. It may be noted that current arrangements in the District allow general waste to be collected by municipal workers while medical or healthcare waste and hazardous waste are to be collected by specialized waste management companies and such waste is disposed of outside the borders of the Sedibeng District Municipality.

The chapter further delved into the adoption of strategies that could be taken into consideration by the municipality to ensure that the volumes of waste sent to the landfill site is being drastically reduced. For that matter, the usage of waste or residue from neighbouring companies as secondary raw material was seen as the appropriate strategy that could be applied by companies. This will help to reduce the volumes of disposable wastes that were initially destined for the landfill site. For companies that participate in such schemes, lesser funds will be spent on the acquisition of raw materials whilst the residue generating company will gain some financial benefits.

In the next chapter, emphasis will be given on the empirical study on how waste management activities are conducted around the Sedibeng District Municipality, the different types of services offered to the residents as practised by the three local

municipalities namely: Emfuleni local Municipality, Lesedi Local Municipality and Midvaal Local Municipality.

CHAPTER 4

EMPIRICAL STUDY ON WASTE MANAGEMENT PRACTICES AT THE SEDIBENG DISTRICT MUNICIPALITY

4.1 INTRODUCTION

The chapter reports the findings of the empirical study conducted on waste management practices at the Sedibeng District Municipality. Data was collected from councilors, officials and local residents in the three local municipalities under the Sedibeng District Municipality, which are the Emfuleni, Lesedi and Midvaal Local Municipalities. Data was collected from officials of neighbouring municipalities of areas such as Ngwathe District Municipality and Metsimaholo Local Municipality in the Free State Province and the Ekurhuleni and Johannesburg Metropolitan Councils. Officials from the Gauteng Department of Agriculture, Conservation and Environment (GDACE) that are involved in the management of waste in their respective employments were also selected for the research. Data was collected in the form of questionnaires and interviews with identified respondents.

4.2 RESEARCH METHODOLOGY

Adams and Schvaneveldt (1985:16) explain research methodology as the application of scientific procedures towards acquiring answers to a wide variety of research questions.

The purpose of this study is to investigate and determine causes of waste and to bring problems of illegal dumping in the three local municipalities under control. Furthermore, it is to determine ways and means that can help reduce existing waste volumes which could subsequently result in the formulation of recommendations that can lead to cost saving strategies that can be realized after the implementation of such identified strategies that will ensure a sustainable household refuse removal service within the Sedibeng District Municipality.

For the purposes of this study, the research methodology used included methods such as questionnaires, which involved open-ended questions, telephone and personal interviews, structured and unstructured interviews. Unstructured interview was conducted in order to collect more and relevant data regarding the problem on the provision of waste management services at the Sedibeng District Municipality because the approach did not restrict the respondent from giving his/her own opinion. This strategy is similar to an informal interview format whereby respondents were open to questions that were not structured. This type of discussion helped save a lot of time for the researcher from moving up and down in search for information. In order to make this study more relevant for the intended purpose, correct and relevant information or data needed to be collected using acceptable research methodology strategies.

As the researcher is an Assistant Manager in the Emfuleni Local Municipality attached to the Waste and Landfill Management division, a purpose of this study was to invite inputs from various members of the community as well as key personnel members from nearby municipalities on how problems of illegal dumping and increased waste volumes that is

deposited in local landfill sites can be reduced as well as ensuring that the problems related to illegal dumping, is brought under control.

The rationale behind the whole process is to learn from other stakeholders about their perception and experience with regard to the management of waste in their areas, and strategies they could give on how best problems pertaining to waste could be brought under control. Respondents were asked about their occupation, position held and the name of the company with which they are employed (where applicable) in order for the researcher to know the respondents he is dealing with and to assess the degree of their understanding of the subject under investigation.

4.2.1 Qualitative Methods

Chadwick et al (1984:206) regard the term qualitative methodology as referring to those research strategies such as participant observation, in-depth interviewing, total participation in the activity being investigated, field work and how this allows the researcher to obtain first hand information or knowledge about the empirical social world. The authors further state that qualitative research methodology does allow the researcher to get close to data thereby developing the analytical, conceptual and categorical components of explanation from the data itself rather than from preconceived, rigidly structured and highly quantified techniques that channel the empirical social world into operational definitions that the researcher has constructed.

The collection of data by the qualitative methodology is normally done in a natural setting

which entails that the variables being investigated are studied where they normally occur or where they are located and not in a situation that is controlled by the researcher (Gay 1990:209). This interaction of the researcher with the respondents enables them to exchange first hand data through the language they all understand best and this further allowed the researcher to know his sample personally as well as to see how they survive through waste related problems as highlighted in the problem statement. During waste collection processes, the researcher is able to see workers physically during removals while waste reclaimers are also seen sifting through the kerbside collection before the waste collection truck could take them to the disposal site.

The research area is wide and as a result there was a need that a specific or target group of respondents be determined. Henning, van Rensberg & Smit (2004:42) highlighted that the objective of identifying a group of people is to capture typical activities and tools as well as ways of communication. This resulted in the selection of 34 officials who are directly linked with waste management related activities as relevant to the research objective because they are daily exposed to the waste management activities in their current positions. On the political side, 33 councilors were selected as respondents due to their involvement in Clean and Green competitions conducted by GDACE as way of encouraging them to influence their communities in becoming involved in the cleaning of their surrounding environments.

Within the different wards, there are environmental committees established within the wards in terms of Local Government: Municipal Structures Act (Act 117 of 1998) The purpose of the committees is to advise ward councilors on issues pertaining to

environmental cleanliness that are coupled to service delivery to each ward. In other words, committees established within wards have become guardians for the preservation of the environment from different sources around the wards. It may be noted that qualitative techniques for the collection of data is in the form of words rather than in numbers and this involves an intensive in-depth description of the phenomena.

According to Mouton (1998:270) qualitative research is distinguished from quantitative research in terms of the following key features:

- Research is conducted in the natural setting of social actors,
- A focus on process rather than outcome,
- The actor's perspective is emphasized,
- The primary aim is in-depth descriptions and understanding of action and events,
- The main concern is to understand social actions in terms of its specific context rather than attempting to generalize to some theoretical population, and
- The qualitative researcher is seen as the "main instrument" in the research process.

4.2.2 Quantitative Methods

Schumacher and McMillan (1993:40) reckon that there is a strong tradition in educational research to use numbers and measurements, which is an approach that emphasizes *a priori* categories to collect data in the form of numbers. Quantitative research method comprises three types namely: Experimental, Quasi-experimental and Correlation method.

Brynard and Hanekom (2006:37) explain quantitative method as techniques that include observation and questionnaires and by counting and measuring objects or people participating in the research hence, a group of officials and councilors were selected for the programme. Quantitative research method was applied in the study in order to record the reaction of officials responsible for the management of waste as well as ward councilors who are custodians of waste functions in their respective wards.

4.3 RESEARCH INSTRUMENTS

According to Creswell (1994:148) data collection steps involve a number of issues that, amongst other things, entail setting boundaries for the study, collecting of information through observations, interviews, documentation, visual material as well as by establishing the protocol of recording information. In view of the above, it is evident that reliability and validity of data measuring instruments are crucial to scientific research. Reliability and validity of data measuring instruments can be briefly analyzed in the following sections.

4.3.1 Reliability

Babbie (2007:143) defines the concept reliability as referring to the quality of measurement method that suggests that the same data that was obtained before would have been collected each time if the same experiment is repeated. In simpler terms, the concept reliability refers to a particular fact that the technique that was employed to obtain data, even if it is applied many repeated times, would yield the same results.

Adams and Schvaneveldt (1985:94) on the other hand view reliability of research as something that had to do with consistency of results when using the same method of investigation over different geographical locations and at different times. Data collection procedures selected by municipalities must be possible to implement, affordable and able to yield planned results. In other words, the concept reliability can be referred to as the consistency of measurement result that has been applied by the researcher in an attempt to acquire a reliable data.

In support of the above statement, Huysamen (1994:117) shows the need for the reliability theory as something that stands to be accepted as is due to the fact that expected results will always be the same. The author further states that it stands to reason that if a construct is measured by means of a particular instrument, it should yield comparable measurement for the same individual irrespective of, for example, when the instrument is administered, which particular version of it is used and who applies it.

It is always acceptable that any information that has been used in any research should yield reliable results. Baker (1988:123) sees the concept reliability as a degree to which a procedure for measuring virtually produces similar outcome when it is repeated. In other words, with reliability, there is a 100 per cent probability that the results expected will actually be the same even if such an experiment happened to have been implemented for some time.

Belson (1986:9) sees the term reliability as a concept that can be used to prove the worth of an issue in order to prove a certain result for more than once and still bring back the same results. Reliability is for instance, the extent to which a measurement consistently represents what has been planned to occur or as an intended characteristics.

4.3.2 Validity

A serious concern was raised by Belson (1986:10) when he stated that the concept validity must never be taken for granted when interviewing people because questions posed to the respondent, may differ slightly from the original in order to let one understand what the interviewer wanted from the respondent. In other words, the degree of understanding or level of comprehension by the respondent could have a greater toll in the validity of the text.

Respondents are normally advised to use the language they understand better and this will be the best weapon to collect data from all individuals and there will be no prejudice on the usage of language. The adoption of the eleven official languages in the

Constitution (1996) qualifies the diversity of people and importance of languages within. According to Lutz (1983:12) the concept validity is the extent to which a measurement truly represents proposed or planned result of an experiment or planned project results.

4.4 DATA COLLECTION METHODS

Methods for collecting data may differ depending on the area where it is applied. According to Babbie (1995:106) a series of questions can be asked during the data collection process which will be aligned to the prevailing situation or the environment where it was applied and these can include questions such as the following:

- How will you actually collect data for your study?
- Will you conduct an experiment or a survey? and,
- Will you undertake field research or will you focus on the re-analysis of statistics already created by others?

In view of the above, sources of data may be classified as either primary or secondary and these will be discussed below.

4.4.1 Primary Source

Sources of data are different and according to Gay (1990:38) primary source of data is in historical research regarded as an eyewitness or an original document or *relic* while in literature, a primary source is a description of a study written by the person who conducts

the research. In this instance, it is safe to say that primary data sources are first hand information collected through various methods such as observation, interviewing and questionnaires.

Data that form the base for new information is old hence places like libraries and archives help researchers to obtain old information. For example, information that is currently used as a source of knowledge for the lifestyle of hunter gatherers, were inscriptions on wall caves that were initially occupied by their fore fathers. Those people never realized that the drawing they made on those walls would ever make a mark in the establishment of their history. Similarly, Chadwick et al (1984:259) made a comment that in the conventional classification, primary source includes artifacts or statements of participants and eyewitness observers or accounts by non-observers based on reports or field notes of participants who are no longer available.

Information used in the study was collected using questionnaires and interviews while some information was collected through observation. As an assistant manager responsible for the cleaning of the Emfuleni municipal area, one is expected to move around the area to ensure that proper service is rendered to the people and where changes are needed to remedy the situation. Such a change will easily be detected.

4.4.1.1 Methods of Primary Data Collection

The methods of primary data collection include the following:

- **Observation**

Collecting data on non-verbal behavior is done by means of viewing, touching, hearing and through smelling. Supervisors normally observe their subordinates in the execution of their duties and this helps them to improve on the contents of the job. It may be noted that supervisors are well informed about the job content hence they have to move into the area at times to assess the situation that might require their immediate attention.

- **Interviewing**

This is a face-to-face conversation between the researcher and the respondent where structured questions are normally asked. Interviews are actually completed by the interviewer based on the information received from the respondent. The researcher is not in a position to reject any of the information received from the respondent because the researcher does not know whether the respondent is honest or not in the whole proceedings hence it is important for the researcher to make follow up questions in order to verify some of the said statements (McNamara 1999: 1). Similarly, interviews were conducted in the three local municipalities targeting individuals responsible for the management of waste so as to obtain valid data on how waste is managed in those respective areas.

- **Computer Assisted Telephone Interviewing (CATI)**

This is an interviewing procedure in which survey questionnaires are displayed on computer terminals for interviewers. The interviewer is not only expected to follow questions on the computer terminal, but also codes the respondent answers directly into the computer (Bailey 1987:201). Procedures followed in the management of waste are more technical in nature and usage of computers help officials in simplifying their jobs. Information used in the study was retrieved from computer recordings done at the weighbridge that was to determine volumes of waste deposited. Programmes installed in these facilities also help to ensure compliance in the determination of landfill slopes as well as the detection of hazardous waste that could be deposited in the site through surveillance that is computer linked that is normally installed in an area of concern. The same facility can detect gas leaks that are generated in a landfill site.

- **Experimentation**

Experimentation involves a study of independent variables under controlled conditions, which could take place either in a laboratory or in the field where the interviewer wanted to see where the interviewee is capable of doing what he applied for. This type of interview involves the creation of an artificial situation like fire training to assess whether the interviewee will be in a position to bring the artificial situation under control. In other words, a schematic representation of a landfill site is drawn before hand that will help the operators to know how the site

should look like, the drainage system that will be required for the site including issues such height or contours of the landfill site as a whole.

- **Mail Survey**

Questionnaires are posted to respondents by mail in order for them to respond to and thereafter they are requested to return the data through enclosed or self addressed envelopes. Councilors participating in the programme were randomly selected from wards because they participated in the Bontle Ke Botho clean and green environmental competitions that are run by GDACE. Councillors were visited at their offices while others were visited at their respective homes. Respondents were further requested to complete the questionnaire themselves while others preferred to go through an interview.

The objective of these competitions is to encourage people to participate in programmes that will render their environment clean. Councilors were visited at their homes and some of them preferred a form of an interview while others opted to reply to the questionnaire at a later stage. Mail survey was sent to councilors in the outer areas of both Lesedi and Midvaal Local municipalities through internal mails managed by municipalities while Emails were sent to those that have offices connected to the main computer networks. 67% of the respondent councillors preferred to go through an interview while 27% of them personally responded to the questionnaire. 81% of official respondents opted for an interview while 19% responded personally to the questionnaire.

4.4.2 Secondary Data

Singleton et al (1988:377) define secondary data as sources that consist of indirect evidence obtained from primary sources. In other words, textbooks, handbooks, review of literature and encyclopedias and a variety of other sources are readily available documents that are already compiled that could be used by researchers as source of data for a given subject for example information on population, census report, and annual reports for the government, are readily available.

Babbie (1992:280) concurs that the existence of secondary sources yields better results for researchers because the already available data gives insight and this will help to broaden the database from which scientific generalization is made. Similarly, data used in the research was acquired from previous municipal reports tabled before council as well as information compiled by consultants on behalf of council. Seeing that the study conducted is more comparative in nature, some of the information used, were obtained from textbooks found in the library.

4.4.3 Questionnaires

Researchers often compile a questionnaire with a list of questions in order to acquire information from respondents about the research matter. Adams and Schvaneveldt (1985:202) define the concept questionnaire as a list or grouping of questions meant for the respondent to answer. The authors further state that questionnaires can be divided into categories that are open-ended and close-ended.

4.4.3.1 Open- ended-questions

In the open-ended questionnaire the researcher is liberal in allowing respondents an opportunity to be able to express their ideas freely where they will able to express their opinion without fear of intimidation or threat. The breaking of the cocoon through this type of questioning, further empower the respondent to express either their concern or frustration about the subject matter.

4.4.3.2 Close-ended-questions

This is when the question format allows the respondent to answer items by checking categories or by providing a brief written response. In other words, a closed-ended question does not provide an opportunity for a respondent to choose an alternative from either a "yes" or "no" answer (Adams & Schvaneveldt 1985:203). It may be noted that the respondent does not have a chance to deviate from the original set-up or initial questioning hence, stringent guidelines to adhere to, would have to be followed. While the Yes and No options left no room for one to explain, the questionnaire format allowed respondents a chance. For example, if the answer to the question is NO, the questionnaire further requested the reason why?

4.4.4 Interviews

Interview is another alternative strategy for collecting data. Interview is normally

conducted in a face-to-face encounter situation where the interviewer assesses the capabilities of the candidate or respondent. Carell et al (1996:187) explain the purpose of conducting interviews as based upon the following:

- To determine whether the applicant will be motivated to be successful and
- To determine whether the applicant will match the needs of the organization.

Interviews can either be structured, semi- structured or unstructured. Interviews can assume any shape mentioned above depending on the type of research. These strategies could be outlined as follows:

- **Structured Interview**

  In this type of an interview, the interviewer makes use of previously compiled list of questions to obtain data from respondents. In other words, the information utilized in the interview is standardized in the sense that the Department will only use those questions that were used in the previous interview. The format of compiled questions is normally based upon current activities that seem to be a problem in a specific environment. For example, one may ask why the problem of illegal dumping increases along the main roads.

  In a situation such as this, the interviewer is interested in getting answers that are relevant to the identified problem including measures that can be employed to solve the problem. Questions appearing in the questionnaire are based on the

provisions of the Minimum Requirements for disposal of Waste by Landfill of 1998 as adopted by GDACE.

- **Semi-structured interview**

In this type of an interview, the most important question required is to assess the ability of an individual or respondent to be able to respond to long set questions through asking questions that have been compiled in advance. This gives the interviewer an advantage as he or she can become flexible by asking extra or additional questions in order to gain insight about the candidate. In other words, the interviewer might have a slight knowledge about the subject matter and a semi-structured questionnaire can help to unleash the potential of the respondent to expose latent information.

- **Unstructured interview**

This type of an interview does not warrant much preparation because questions to be asked will depend on the prevailing circumstances. In order for one to promote a general worker who is not educated for an example, the interviewer will have to look at the performance record of the worker as to how he performed in past year or two to ensure consistency.

This platform further allows the interviewer to conduct a sort of interview that ensures that the interviewee in question can fully participate in the proceedings

because what is needed from the respondent is not the writing skills but the performance skill such as driving a specified machine (Gerber et al 1987:142)

4.4.5. Consultations and Informal Discussions

External researchers are often employed by institutions including municipalities to conduct research on a specific matter on their behalf. The population identified in the research resembles a base of individuals who have been selected by the researcher due to their involvement in the management of waste in their environment while others were selected due to the expert knowledge they have on the subject matter.

Municipalities normally appoint consultants for issues they need information on as a way of complying with legislation because there are specific functions and reports that can only be approved by the government if, they are done by consultants. Consultants are normally appointed by municipalities to conduct functions such as the application of Environmental Impact Assessment (EIA) report. While it is good to mention the importance of consultants in this instance, dangers associated with this decision are the following:

- Consultants can compile a report that is only understandable to themselves and related institutions because of the language used. An unfortunate part is that consultants are not implementers of their recommendations and that could lead to the failure of the project, and

- Officials are normally at the mercy of consultants because of the monopoly they have after their appointment like the reservation of information. This situation normally leads to the imposition of additional charges made by consultants if any further explanations on the subject matter could be required by the municipality.

Informal discussion is another form of collecting data. Informal talks often give one an opportunity to speak to some people about the information one is searching for. Informal discussions are not structured but one would have to sift through the information being researched on. Informal talks often take place when people interact informally.

4.5 SAMPLING TECHNIQUE

According to Gay (1987:101) sampling refers to the mechanism or technique that is employed by the researcher in the process of selecting a number of individuals for a study. The manner that the individuals are selected will represent the larger group from which they represent. Participants selected in the process were in a position to make some inputs into the study area that aims to acquire new answers to old problems affecting the management of waste in the Sedibeng District Municipality especially in areas where these respondents reside.

According to Mouton (1996:134) a population in research can be defined as any set of persons or subjects having common observable characteristics. Hence a group of councilors and officials linked to the waste management functions were selected to form a population for the study.

4.5.1 Aims of Sampling

Several reasons might be given why there is a need for sampling in research. According to Singleton et al (1988:137) researchers often want to know something about a specific social group or population they are studying because people and other social objects vary widely. By studying one case, it will simply not suffice as a basis for generalizing.

4.5.2 Advantages of Sampling

When conducting research, a series of problems often emerges which could derail the objectives of the research at that particular area and time. These problems can involve cases of funds shortage, time usage, coordination and others. According to Adams and Schvaneveldt (1985:179) advantages of sampling are the following:

- The cost involved in measuring a sample is less than that required if one was to assess all elements in a population,

- Time that is spent in the whole process is less, and

- Results that are required in the whole process become available in a much quicker way than expected.

4.5.3 Disadvantages or Limitations of Sampling

Questions may be asked on the authenticity of the selected population, their knowledge on the subject matter as well as their degree of representation so as to assess whether no relevant stakeholders, are left out. In other words, for proper data to be collected for a given subject candidates should have an insight or knowledge of the subject matter and this automatically guarantees their full participation in the entire research process. This action will dispel the myth of poor results that could be based upon knowledge.

According to Gay (1987:115) the selection of sample population in a research could at times not satisfy the required objective. This is because selected candidates who even use the best known technique, does not guarantee that they will be representative of the whole population.

4.5.4 Methods of Selecting a Sample

In order for the expected data to be collected, methods utilized in the process should be appropriate in a way that the correct information should be acquired in an acceptable and systematic manner. In order for the researcher to be able to draw valid inferences from a sample in relation to its respective population, the researcher uses both purposive and stratified random sampling. Stratified random sampling was done first by stratifying the population into segments that were based on the number of permanent public officials and councilors that will be required to participate in the research programme.

4.6 EMPIRICAL RESEARCH

In this section of research attention is given to research processes that need to be undertaken by the researcher, which is data processing and the reporting of the results. The instruments are in a form of questionnaires. The objectives of questionnaires that were given to the selected population were meant to determine the extent of the management of waste in the Sedibeng District Municipality, problems and challenges they come across, the extent of politician involvement in the waste management processes, and inputs they make to help minimize the problem of illegal dumping in the entire Sedibeng District Municipality.

This is a report back session of the interviews that were conducted in the research process. Two questionnaires were compiled for both officials and councilors as data collection instrument. The usage of different types of questionnaires was for the researcher to be able to reach the salient areas of the research field where both officials and councilors are involved in the waste management processes. In other words, the relevance of the study is to determine the involvement of the abovementioned stakeholders in waste management activities in an attempt to render a healthy and a sustainable environment.

As highlighted earlier, political respondents which are councilors, were selected from the three local municipalities under the Sedibeng District Municipality on the basis that they currently participated in the Bontle-ke-Botho clean and green programmes that are run by the Gauteng Department of Agriculture, Conservation and Environment (GDACE) to

encourage members of the communities to realize the importance of a cleaner environment. Respondents were asked to reply to the questionnaire attached while others opted to have an interview with the researcher. Administrative respondents which include officials in the department were selected on the basis that they are hands on and are responsible for the implementation of waste management activities in their respective local municipalities and general workers did not form part of the respondents. Some of these respondents also opted to have an interview while others responded to the questionnaire at their own. This sample includes manager of the department, assistant managers, superintendents and supervisors.

4.6.1 Questionnaire for Officials (Annexure A)

Questions directed to officials were as follows:

Questions 1 and 2.

How is your municipality demarcated with regard to cadastral boundaries and how many households units do you have in your area?

Respondents were asked about the number of households in their respective municipalities including a description on how boundaries of their municipalities were demarcated. 100% of respondents indicated that they are aware of how boundaries of their municipalities are instituted as well as the demographic status of their areas.

Respondents further indicated that boundaries of the three local municipalities are totally different from each other and as a result, different answers were received as follows:

- Emfuleni – there are about 155 000 households units in a municipality of about 987.45 Km2 extending along the 120 km axis from east to west with a population of about 680 000 people. The municipality shares boundaries with Metsimaholo local municipality and Fezile Dabi District Municipality in the Free State side and Midvaal Local Municipality to the east while Johannesburg Metropolitan Municipality lies at the north and the Westonaria and Potchefstroom Local Municipalities are on the western side.

- Lesedi – the area is about 1430 km2 in extent and has a population of about 106 350 people. The area borders the Emfuleni Local Municipality on the east and is located on the southern edge of the Gauteng Province. The municipality also shares borders with the Ekurhuleni Metropolitan Municipality and the Midvaal Local Municipality.

- Midvaal – the area is about 1724 km2 in extent and has a population of about 95 146. The area is located on the southern edge of the Gauteng Province and shares boundaries with Lesedi, Emfuleni Local Municipalities, Johannesburg and Ekurhuleni Metropolitan Municipalities.

Question 3

Do you have any informal settlements in your area and if so, what types of services do they receive from the municipality?

The response to this question differed based on the area of respondents. This is because there are town areas that are mostly well developed while previously disadvantaged areas are characterized by shacks and informal settlements. 100% of respondents indicated that informal settlements are normally found in formerly disadvantaged areas and they raised a concern that settlements are virtually new and were recently established. Respondents reckon that site allocation in these areas, is done by unscrupulous community leaders who deliberately, defy municipal planning policies meant to control settlement of the people. The number of such settlements is also not yet determined due to fact that site allocation process is still continuing.

Respondents with similar problem further stated that the only type of service received from the municipality is water and refuse removal in the form of illegal dump refuse removal programme.

Question 4

As an official, are you satisfied with the type of service that is rendered in your municipality and if no, what could be the problem?

Different statements were received towards the type of service that was rendered amongst the three local municipalities. 60% of respondents indicated that they were satisfied with the type of services currently rendered in the area whereas the remaining 40% indicated that they were not satisfied with the type of services rendered because better services are only rendered in town. The latter group also indicated that good equipment normally gets allocated only in town areas unlike in formerly disadvantaged areas. Respondents from the district are not directly involved in the management of waste and as a result performance of officials in local authorities might sometime not satisfy their expectation.

Respondents further indicated that they were worried about the increase in the number of new houses recently built by the Provincial Government for the people without involving local municipalities because most of the houses are not provided with municipal infrastructures such as streets, roads and electricity network. They further stated that before the 2009 National and Provincial elections, scores of people were seen barricading roads with rocks protesting against poor service delivery.

Respondents further commented that the building of houses is not the competency of local municipalities and it is difficult for local municipalities to provide such services highly sought by residents because they have no funds available to budget for a project similar to these.

Question 5

Does your municipality own any Waste Transfer Stations or Mini Dumps and if so, how do you service them?

Respondents from the Emfuleni Local Municipality indicated that there are four mini dumps in the area and these facilities are meant to accommodate builder's rubble and garden waste only. They reckon that these facilities are serviced once a week depending on the amount of waste deposited at the site.

Respondents from the Midvaal Local Municipality indicated that there were three mini dumps at their area serving similar purpose.

Respondents from the Lesedi Local Municipality indicated that there is neither a landfill site nor a mini dump in the area. Instead, a waste transfer station has been established to accommodate waste from the area for disposal at the Platkop landfill site outside their borders. Respondents further indicated that green waste and builder's rubble from the area is disposed of at the Poortje quarry next to the Heidelberg airport.

Respondents explained that mini dumps receive builder's rubble and green waste only whereas a Waste Transfer station is a transitional waste disposal site that temporarily store household waste in preparation for bulk transportation to the landfill site outsideits area of jurisdiction. This facility accepts all forms of waste such as papers, cardboards and plastics other than medical, green waste and builder's rubble.

Question 6

How is toxic and medical waste handled in your municipality?

All respondents indicated that the Sedibeng District Municipality together with its local municipalities, do not have the ability and capacity to handle medical and toxic waste from its clinics, hospitals and medical centers. Instead such institutions have entered into a contract with private companies to handle such forms of waste on their behalf. In the Sedibeng District Municipality for example, Buhle Waste Management Company is responsible for the removal of medical waste from the abovementioned institutions.

Similarly, respondents reckon that there are no landfill or disposal sites around the Sedibeng District Municipality that are suitable and capable of accommodating toxic waste. Respondents further indicated that medical waste and all forms of hazardous waste from this area are disposed of at the Holfontein landfill hazardous site situated in the Ekurhuleni Metropolitan Municipality near Springs.

Question 7

How many landfill sites does your municipality have and how are they serviced, e.g either by council or private contractor?

Respondents answered this question based on information existing in their respective

municipalities. Respondents from the Emfuleni Local Municipality indicated that there are four operational landfill sites in their area namely: Boitshepi, Palmsprings, Vaaloewer and Waldrift. Respondents further stated that Boitshepi and Waldrift landfill sites are operated by a private company employed by council whereas Palmsprings and Vaaloewer are under the control of the municipality.

Respondents from the Midvaal Local Municipality indicated that there are three operational landfill sites in their area namely: Henley-on-Klip, Vaal Marina and Walkerville. Respondents indicated that landfill sites in their area are operated by private contractors appointed by the municipality.

Respondents from the Lesedi Local Municipality indicated that there are no landfill sites in the Lesedi Local Municipality. Instead a waste transfer station situated in the Heidelberg area was established, which is used for conveying waste to the Platkop landfill site.

Question 8

Are your landfill sites licensed and if not, what could be the problem?

All respondents based their answers on current information happening in the respective local municipality. The following information was obtained from respondents:

- Respondents from the Emfuleni Local Municipality indicated that there are four operational landfill sites within their borders and only one of them, which is the

Palmsprings, is licensed. They further indicated that consultants were appointed to conduct an Environmental Impact Assessment (EIA) for the remaining sites.

- Respondents from the Midvaal Local Municipality indicated that there are three landfill sites in their area and none of them is licensed. They reckon that reports were tabled before Council to approve for the appointment of a company that will take them through the licensing processes for the sites.

- Respondents from the Lesedi Local Municipality indicated that there are no legal landfill sites in their area except for an illegal dumping area in the Devon area. They further indicated that waste collected in the area, is temporarily deposited at the Waste Transfer Station for disposal at the Platkop landfill site.

Question 9

What kind of problems do you experience when managing landfill sites within the area of your jurisdiction?

Answers from respondents differed from area to area. All of them indicated that the numbers of waste reclaimers is increasing in all the landfill sites and if not well handled, it will create a problem for landfill sites users. The response to the question was given as follows:

- Respondents from the Emfuleni Local Municipality indicated that there were about 350 waste reclaimers at the Boitshepi landfill site, 170 at the Palmspring site, 65 at the Waldrift site and 32 at Vaaloewer site. Respondents reckon that due to the increased number of reclaimers, some sites have been turned into a haven of evil activities where some reclaimers have become thugs who hijack vehicle during off load of waste. They further stated that these thugs, especially in the Boitshepi landfill site, are unruly and they damage municipal trucks that arrive at the site to off-load waste.

- Respondents from the Midvaal Local Municipality indicated that there are reclaimers at their landfill sites but they are not sure of their number as these sites are located next to informal settlements, and

- Respondents from the Lesedi Local Municipality indicated that there is a Waste Transfer Station and an informal waste disposal at the Devon area. They reckon that there are organized waste reclaimers who recycle waste at the area to their advantage.

Question 10

How are problems of illegal dumping, handled in your municipality?

All respondents admitted that they have a problem of illegal dumping in their respective areas especially highly populated residential areas. Respondents from the Emfuleni Local

Municipality indicated that they have a team dedicated for the removal of illegal dumps in all the wards. These dumps are more prevalent in formerly disadvantaged areas. 50% of respondents in the Emfuleni Local Municipality saw the emergence of more volumes of illegal dumps as attributed to non-existence of mini dumps.

Respondents from both the Midvaal and Lesedi Local Municipalities indicated that their areas are sparsely populated and in between these areas, scores of dumps are often found along the road. They further indicated that greater parts of their municipality do not receive any form of service except residents in town centers.

Having realized the challenges of illegal dumping in these areas, respondents further indicated that a message was communicated to residents by council not to dump waste in a haphazard manner but to dump waste responsibly by identifying a single spot for dumping waste and also to start making compost in their yards. Waste from these spots, is regularly removed by municipal trucks.

Respondents also highlighted the fact that much of the waste is found dumped along the main roads and in secluded places where no one is able to recognize them easily. This is an indication that the dumping of such waste is done discreetly in the evening.

Question 11

Has your municipality entered into any service partnership with private companies around your area for the management of any of their facilities and if yes, what type

of relationship do you have with them?

Respondents indicated that municipalities have entered into a contract with private service because of the expert knowledge they have regarding the management of landfill sites as outlined in the Minimum Requirements for Disposal by Landfill Site of 1998.

Respondents from Lesedi Local Municipality stated that their municipality has entered into a contract with private service providers for the provision of services in areas such as Vischkuil and Endicot which is not accessible. The Midvaal Local Municipality had entered into a contract with a private company for the collection of waste and management of the landfill site at the Vaal Marina area.

Question 12

Do you have any waste recycling centers or buy-back centers in your area and if so, who owns them?

Respondents indicated that four (4) buy-back centers were established for the Sedibeng District Municipality but only one of them situated in Evaton, is still operational. They pointed out that funds to establish these centers were obtained from the provincial government as a way of creating informal jobs for the unemployed people. Respondents further indicated that municipalities only came into the picture when they were expected to provide a piece of land and water for cleaning some of the recyclable materials.

Question 13

It is known that there are waste reclaimers in your different waste disposal sites; how do you control them?

Respondents answered this question based on activities taking place within their respective local municipalities. Respondents from the Emfuleni Local Municipality indicated that names and places or origin of waste reclaimers found in their landfill sites are known and have been recorded by landfill operators after it was realized that there are intruders coming into the site who cause havoc to landfill patrons.

Respondents further mentioned that there was a need to determine the number of reclaimers because they had to be categorized into groups for the waste collection truck that is offered to them by the municipality for the delivery of waste to buyers. They further stated that when reclaimers use a municipal truck for waste delivery to buyers, each user is allowed four bags and is required to pay R10 - 00 instead of R170 – 00 they used to pay to the private person.

Respondents from the Lesedi Local Municipality indicated that waste recycling takes place at the Waste Transfer Station. Selected individual reclaimers work for their own purse at the site. Respondents further reckon that the establishment of the facility has helped the municipality a lot in the reduction of the waste volume that was destined for the Platkop landfill site outside their borders.

They further reckon that some reclaimers within the municipality, especially in town centers have organized themselves in groups to operate shops and businesses to collect recyclable. These people organize transport of their own for the delivery of waste to the buyers.

Respondents from the Midvaal Local Municipality also indicated that there are waste reclaiming activities in the surrounding environment and this includes areas such as backyards, along the main streets and in landfill sites. They reckon that reclaimers are not organized into groups like in Emfuleni but each person collects waste from available source on one` own. These people are allowed access into the premises without restriction by the security who guard equipment.

Question 14

Given a chance to decide, what can you do to bring the problem of the management of waste under control in the near future?

All respondents reiterated that the problem of waste is far from being won. They cited the problem of illegal dumping as a major cause to environmental pollution that is coupled with the problem of uncontrolled urbanization process whereby every open piece of land is seen as suitable for residential purposes. Current waste management strategies employed by municipalities seem not good enough as there are no stringent penalties.

Respondents further highlighted that in order for the situation to change, planning for

solution should be done through involvement of all stakeholders. This should include the officials from municipalities and the residents because planning for the people without involving them could be disastrous. Existing communities within the wards should be roped in to form part of the decision making team in order to solve problems identified within the wards.

Question 15

How are By-Laws on Waste Management implemented in your municipality?

Respondents raised some dissatisfaction about the existence of By-Laws within municipalities. Some of their concerns are the following:

- Emfuleni – By-Laws were approved in 2005 and the Municipal courts came into existence during 2007 but existing By-Laws were not yet implemented because they are said to be outdated. In other words, there is a need for the municipality to compile a set of new By-Laws to ensure that all problems identified in the area can be dealt with.

- Lesedi – By-Laws in the area are said to be outdated and their greatest concern is that if such by-laws were implemented, it would create more problems for the municipality because all those outdated policies, regulation and Acts of parliament were based on old Acts which have all been repealed.

- Midvaal – there are no by-laws in place that can be used to charge offenders. Respondents from this area stated that the municipality took a resolution to compile a set of new by-laws that will become operational in the near future.

4.6.2 Questionnaire for Councilors (ANNEXURE B)

Councilors are community representatives with regard to service delivery and as a result, the inputs they have on how services are rendered in wards, are of importance for the study. Questions asked in the study aimed to explore whether the politicians understand their role as councilors regarding service delivery, the change they can bring that could ensure a cleaner wards and cleaner environment. Respondents were requested to answer the following questions based on the experience and knowledge they have pertaining to service delivery in their wards, challenges they come across as well as proposals they can bring forth in order to remedy the situation.

Question 1

Do you know how many household units are there in your ward, population figures as well as the demarcation points of your ward boundaries

All respondents from the three local municipalities indicated that they were quite conversant with the demarcation boundaries and demographic status of their respective wards and they are aware of the number of houses in their respective areas including the population.

Question 2

Do you have any squatter camps in your ward and as a councilor, what type of assistance do you offer them?

Respondents with wards that are fully built and those that are adjacent to town areas indicated that they had no squatter settlements in the areas. 80% of respondents residing in formerly disadvantaged areas indicated that there are backyards shacks that are used to accommodate extended family members. 20% of the respondents indicated that in areas that are situated on the periphery of existing residential settlements, squatter settlements are coming up in great numbers. They reckon that they are invading valuable pieces of land that can be used either for agriculture or housing.

Respondents from the Midvaal Local Municipality indicated that around 2700 informal settlements were recorded, 1900 at the Emfuleni and no figures were available from the Lesedi Local Municipality.

Question 3

Do you have an idea what the concept Waste Management entail or mean?

60% of respondents indicated that they know and understand the meaning of the concept but the manner in which questions were answered makes the researcher doubt whether

the respondents really do understand its real meaning. 40% of the respondents simply indicated that they do not have a clue or an answer to the real meaning of the term.

Question 4

Is there any house-to-house waste collection service rendered in your ward; how many times is it rendered in a week; are you satisfied with it?

Respondents from the three local municipalities indicated that house-to-house refuse removal service is done in all the areas but the service is not 100% satisfactory as expected due to the following reasons:

- Refuse removal service is weekly rendered to155 000 houses in the Emfuleni Local Municipality but newly built houses in new areas are currently not included in the collection schedule because they were not budgeted for and there are no road access to some areas.

- Respondents from Midvaal Local Municipality indicated that there were about 18 900 housing units in their area but only 8 000 of them are weekly serviced as according to the collection schedule. They further reiterated the Council is putting plans in place to include the remaining units into the collection schedule before the end of 2011.

- Respondents from the Lesedi Local Municipality indicated that there are 15 225 houses in their waste collection schedule. These houses are serviced twice a week. They further indicated that there are parts of the municipality that are serviced by a private contractor while this type of service is rendered in fully built areas and in town area.

Question 5

Do you have an idea of what waste recycling is all about and as a councilor, in what ways are you involved in such waste recycling activities?

Respondents indicated that they do understand what waste recycling is about and on many occasions, respondents as community leaders spearhead such projects within the community. Respondents reckon that projects such as these are a brainchild of environmental cleanliness programmes where residents aim to inform people about good livelihood through making money out of waste materials. Waste recycling is linked to both environmental cleanliness and job creation that can lead to poverty alleviation.

Question 6

Do you see the importance and benefits of waste recycling in your ward?

All respondents reiterated that waste recycling activities, may look insignificant to an individual but families found on landfill site gain from it. The greatest benefit above all is

that lesser waste is now found on the street and there is also lesser waste for disposal by waste collection trucks. Respondents indicated that the municipalities now spend less money in acquiring cover material for landfill sites.

Respondents further indicated that while members of the community benefit from the waste they gather at the site after sales, the municipality is saving thousands of rands because there is lesser waste that requires to be covered at the site.

Question 7

How do you enforce provisions of By-Laws in your ward or is it a matter beyond your reach?

Respondents answered the question based on prevailing circumstances in their local municipalities. Respondents from the Emfuleni Local Municipality indicated that By-Laws were approved in 2005 but were not yet implemented. Council took a resolution that a By-Law Implementation Team should be established to ensure that all provisions stipulated, should be implemented as planned. In the Lesedi Local Municipality, it was highlighted that their By-Laws were obsolete and it will be difficult for the municipality to implement.

Respondents from the Midvaal Local Municipality indicated that their By-Laws were long outdated and it will be difficult for them to implement them as is. They further stated that plans were in the process of being finalized by Council for the compilation of new sets of By-Laws for the municipality.

Question 8

As a councilor, what seems to be a serious problem with regard to the management of waste in the municipality as a whole as well as in your ward?

Respondents highlighted a number of problems they come across in their wards as follows:

- There is lack of community involvement in waste management activities in wards. Some members of the community even fail to take out waste from their households on specified days due to ignorance of collection days.

- There are not enough clean up campaign programmes that are conducted within the wards,

- There are no mini dumps that have been built around their wards for the disposal of green waste and builder's rubble in formerly disadvantaged areas,

- Mis-use of newly acquired waste receptacles for the purpose they were not meant for such as using receptacles as beverages and ice holders or for storing clothes.

- 10% of respondents blamed officials for negligence, and

- 20% of respondents highlighted the problem of poor road network.

Question 9

In your opinion, what is the best method that can be applied by the municipality that can help bring problems of increased waste volumes in different ward under control?

Respondents made comments to the question based on the area where they operated:

- There is a need for municipalities to formulate By-Laws and to enforce them in order to curb the generation of excessive volumes of waste,

- All respondents residing in formerly disadvantaged areas suggested that mini dumps should also be established in order to curb problems of illegal dumping that is caused by resident when dumping builder's rubble and green waste because these areas were not provided with facilities that can accommodate these forms of waste,

- There is a need for the compilation of departmental programmes that will rope in community leaders, environmental ward committees, councilors and municipal officials to help regulate the generation and disposal of waste in the three local municipalities,

- The usage of old waste collection trucks must be minimized because they spend more time in the workshop than at work, and

- Changes should be made in the determination of the individual rates where people with more waste bags should be charged a higher tariff than residents with fewer waste bags.

Question 10

Do you see the current waste management activities in your ward as effective enough to sustain environmental cleanliness as prescribed in legislation and if no, give some reasons why?

Respondents answered the question based on activities taking place within their wards. When 40% answered "yes", 60% answered "no". Respondents gave some reasons why they differed:

- The current service is poor and will not sustain environmental cleanliness as envisaged it the Section 24 of the Constitution of South Africa Act 108 of 1996,

- All respondents with no accessible road network especially areas with newly developed houses with no roads, simply answered "no", and

- 80% of respondents stated that there is need for additional workforce and better equipment should be made available. The remaining 20% stressed the importance

of removing old trucks from the services of the municipality because these are seen as delaying service provision process with the wards.

Question 11

Given a chance to decide for the municipality, what changes can you recommend that could help bring problems such as illegal dumping and the generation of current massive waste volumes under control?

Respondents highlighted the following:

- Poor service delivery as it is linked to waste management must be seriously tackled and this is attributed to non-implementation of existing By-Laws while in some other areas, new policies should be enshrined in legislation to help solve the problem of haphazard dumping of all forms of waste,

- Community education should be encouraged within the wards to ensure that all members of the community could become aware of the dangers associated with uncontrolled waste that is normally generated within the wards as this will help people to change their attitude towards waste generation,

- 90% of respondents stated that environmental policing should take place in all the areas especially those that have been turned into dumping hotspots. Offenders

would have to receive a fine or some form of punishment that will help to deter others from creating further problems, and

- More people should be employed in environmental cleansing programmes that are normally instituted in the department as part of the Expanded Public Works Programme (EPWP) that is supported by national government. The programme helps in the creation of jobs and help train people to become financially independent through the establishment of small businesses.

Question 12

How is the concept of environmental cleanliness promoted in your ward and who are the stakeholders?

Respondents indicated that their role is to promote environmental cleanliness and this was only possible through the recognition of community structures existing within the wards. They reckon that community structures that exist within the wards are watchdogs for the environment that seeks to keep the areas clean. Respondents further indicated that Community Development Workers (CDW) were, introduced within the wards by the Provincial government who form part of the monitoring team and they also play an advisory role to councilors.

Respondents further highlighted the fact that they work in conjunction with members of the community whereby clean up campaigns are always done within the wards, the same

applies to Bontle-ke-Botho (BkB) clean and green programme that was initiated by the GDACE to encourage residents to keep their areas clean.

Respondents further indicated that cleaning programmes initiated by councilors within the wards, always receive municipal support with regard to equipment availability. They further stated that apart from equipment and plastic bags that are supplied for programmes, municipal workers always form part of the team.

Question 13

As councilors, how do you address the problem of builder`s rubble and green waste that are generated in your wards?

80% of respondents indicated that the question of builder's rubble and green waste is a challenge in all the wards. They reckon that no mini dumps existed in formerly disadvantaged that can be used for their disposal. Respondents further stated that officials normally advised residents not to dump such waste at the periphery of their yards. Respondents indicated that municipal officials encounter further problems as follows:

- Builder's rubble and green waste were too heavy to be loaded into a waste collection truck and as a result, it requires a specialized collection trucks such as tipper trucks and Front-End-Loaders,

- There are no facilities that can be used by the residents for the disposal of builder's rubble and green waste, and neither do residents have vehicles to carry these types of waste to the relevant disposal site, and

- Residents on the other hand have no choice but to disregard municipal directives of not dumping due to the fact that their waste is not acceptable in the municipal waste collection and neither are there dumping facilities available for them to use. Residents dump such waste at night while during the day officials roam the street threatening offenders with fine for non-compliance.

Question 14

How often do you hold public meetings in your ward in an attempt to address problems related to the management of waste?

All respondents indicated that they regularly hold community meetings to discuss waste related problems emerging in their wards. They further highlighted the fact that residents have always been advised not to dump waste in a haphazard manner as this often led to the problem of illegal dumping.

Question 15

In your opinion, do you see any future improvement in the current waste related problems generated in your wards?

Respondents indicated that residents are aware of the waste related problems around their yards as well as the effects of waste deposited but they are optimistic that, changes can be effected to the current situation. They reckon that through involving all members of the community to focus on the waste related problem, it could be easier for one to come up with a solution. Respondents also highlighted that it should be noted that the area is increasing in size the same applies to the number of houses and these impact on sustainable service delivery.

4.7 Conclusion

This chapter presented the methodology used in the study. It described the research methodology, the research instrument, data collection methods, sampling technique and empirical research.

The aim of the study is to research how waste management functions are practised in the Sedibeng District Municipality with reference to different practices applied in the three local municipalities under the Sedibeng District Municipality. The data for the research was collected using questionnaires, interviews and observation.

Two types of questionnaires were compiled for officials and councilors as data collection instrument. Answers were analyzed descriptively and inferentially as views from respondents differed from area to area. The results and findings of the study are presented in Chapter Five.

CHAPTER 5

SUMMARY, FINDINGS, RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents summary, analysis, findings and recommendations that were obtained through questionnaires, interviews, observation, consultations and informal discussions. The aim was to understand how waste management programmes are handled in the Sedibeng District Municipality specifically focusing on procedures and methods as they are applied in the three local municipalities which are: Emfuleni, Lesedi and Midvaal. This chapter further identifies and analyses responses received from different respondents and make recommendations on how to improve waste management practices that are currently employed in the area. The findings of the study are organised according to the specific objectives identified of the study and these include the following:

- To identify causes of poor service delivery that is currently experienced in the Sedibeng District Municipality;

- To identify causes of massive illegal dumps that emerge in unoccupied open area within the municipality;

- To explore practical mechanisms that can be utilized to resolve problems around landfill site management as well as the control of waste reclaimers that operate waste recycling activities at different landfill sites;

- To identify bottlenecks and stumbling blocks that are responsible for hampering normal house to house refuse removal services provided to the Sedibeng communities;

- To identify solutions that can help to improve service delivery; and

- To recommend strategies and policies that can be employed by municipalities to advance waste management functions in the District.

5.2 SUMMARY

The objective of the study was to probe the extent to which current waste management practices impact on environmental cleanliness of the Sedibeng District Municipality. The causes of these include the emergence of illegal dumps in greater parts of the municipality, the increased waste volumes that are deposited in local landfill sites and the uncontrolled waste disposal processes of toxic and healthcare waste which normally take place at night along the main roads and in public open spaces.

Chapter one of the study, starts with a problem statement that indicates how poor waste management activities that are currently practised in the Sedibeng District Municipality

can impact on the lives of the residents if not properly handled. Mention was made of causes of environmental problems such as air and water pollution that are attributed to poor service delivery that is orchestrated by issues such as shortage of equipment, non-existence of By-Laws as well as non-cooperation by residents who do not take out waste from their houses on specified days as expected.

Chapter two of the study provided a theoretical exposition of the concept waste and waste management. The objective of the chapter was to give a clear explanation of what is entailed with the abovementioned terms and how the meanings of the terms are interpreted both locally and internationally.

Chapter three focused mainly on procedures and methods that needed to be followed in the management of waste as adopted by respective local municipalities. The chapter further emphasized more on the waste classification procedures, the procedures and techniques to be followed when handling different forms of waste. It may be noted that there are different forms of wastes that warrant different strategies for their handling for, if not properly handled, can result in serious pollution to the environment and this could affect the lives of the people. The chapter further provided information to waste handlers by classifying the different types of waste as specified in the Minimum Requirement of 1998. There was a caution to both waste reclaimers and handlers not to accidentally expose their lives to dangers through the type of waste they handle.

Chapter four of the study focused on the research methods to collect data as well as the outcomes of the data collected by means of empirical study. The chapter also highlighted

the different methods that were used to collect data, the population sample, and two types of questionnaires that were compiled for both councillors and officials. Responses from different respondents who provided inputs and views were analyzed.

5.3 FINDINGS

Research questions for the study were compiled in line with the hypothesis of the study where it was indicated that waste management schemes and practices currently practised in the Sedibeng District Municipality are obsolete, outdated and inadequate to attain a cleaner environment and as a result, there is a need for the development of more cost effective strategies in the waste management fraternity that will help solve the problem. The following findings arose out of the study:

- There was dissatisfaction from officials in the waste management departments of the three local municipalities that all By-Laws are outdated and can no longer be used as a control tool to bring stability in waste management departments. It is ironic that leaders of the municipalities are aware of the problem, yet they condone the use of By-Laws.

- It was shown that there is a dramatic increase in population growth and housing. It was further revealed that 99% of the people that are currently receiving low cost houses are unemployed and there are no forms of payment that will ever be expected from them for services that were rendered by municipalities.

- Funds for the provision of services are not enough and this often results in the reduction of services to other areas.

- It was found that some types of waste such as green waste and builder`s rubble are dumped along the road probably by "fly-by-night" residents who evade rate payment.

- It was found that some members of the community do not take out waste from their houses on specified days as expected and they only do that after the waste collection truck has passed their area. To others, the waste collection truck arrives too early when it is still cold while others cite their employment schedule as a cause.

- There are elements within the community who believe that by dumping waste haphazardly, will compel the municipality to identify the need to create some jobs.

- Political functionaries accused officials of negligence towards poor service delivery.

- Low cost houses that were recently built were not provided with access roads. This has created a problem for the municipality because no house-to-house service can be rendered in those houses. Residents in these areas resort to illegal dumping of waste from their houses.

- Low cost houses that are currently built are squeezed into a small area resulting in narrow yards and streets which hamper efficient use of heavy waste trucks.

- Some residents in the Emfuleni Local Municipality reject provision with waste collection service in view of increased rates and taxes and this has resulted in illegal dumps around those plots.

- Emerging private waste management contractors have turned themselves into a nuisance due to illegal dumps they create. The majority do not dispose waste at relevant waste disposal sites. Instead they deposit waste wherever there is an open and unoccupied space to evade payment for the waste disposal fee at the landfill site.

- It was found that much of the waste found strewn along the streets from moving vehicles that are en route waste to landfill sites.

- It was found that informal settlements in a number of areas are not provided with any form of service and this action, normally lead to the problem of illegal dumping. In areas such as these, tipper trucks and Front-End Loaders are used at regular intervals to collect waste depending on the amount of waste that has been created at the area. The provision of services to areas such as these is difficult because some of these areas are overcrowded and there are no access roads that can be used.

- It was found that some forms of waste were created by recyclers whose end products were no longer in demand.

- It was found that landfill sites within the Sedibeng District Municipality accept only general waste and there are fly-by-night contractors who collect healthcare waste and toxic waste from generators such as private clinics who, instead of transporting such waste to Holfontein landfill, dump them in public open spaces. Such waste is found mixed with general waste and gets deposited at a general landfill site. Cases of this nature were always reported to operating company to ensure that they intensify their search at the entrance to avoid such occurrences.

- It was found that in areas where refuse removal services are rendered, waste disposal mechanisms vary from burning and disperse and to composting. This forms part of the various options that residents can use to keep their areas clean.

5.4 RECOMMENDATIONS

For the Sedibeng District Municipality to be able to address problems identified in the study and to comply with its constitutional mandate that there is need to change some of the strategies that are in place. Efficient services should be provided to residents as expected as this will help to protect the environment from various pollutants. To attain the above constitutional obligations, the following recommendations need be considered for possible implementation.

5.4.1 Adoption of Polluter Pays Principle

It is recommended that local councils under the Sedibeng District Municipality should adopt and implement this principle to ensure that the guilty party pays a fine for the wrongs committed. In other words, the polluter bears the costs that pollution damage or pollution control measures impose.

5.4.2 Upholding of Cradle to Grave Principle

It is recommended that all municipalities should ensure that there is constant commitment to responsible care that should be made throughout the entire process of the project or service cycle from the reconnaissance and conceptual phases to rehabilitation and after care.

5.4.3 The Importance of Public Participation and Community Education

In order for municipalities to promote patriotism, in the provision of a sustainable refuse removal service for the people, municipalities should encourage members of the community to become involved in the adoption of decisions that will affect them even in future. In other words, there must be a buy-in that should be done by residents as their participation will generate their interest to own and to protect the project.

5.4.4 Developing and Legalizing of Landfill Sites

Landfill sites should run as business and make profit for municipalities. There are seven operational landfill sites in the Sedibeng District municipalities and only two of them are equipped with relevant infrastructure that is able to generate income for municipalities. It is recommended that municipalities need to fast track the development of the required infrastructure in the remaining five landfill sites in line with the provisions of the Minimum Requirements for Waste Disposal by Landfill of 1998.

5.4.5 Introduction of Environmental Inspectors

All respondents indicated that there is a problem of illegal dumping that take place in the majority of wards especially in formerly disadvantaged areas. These illegal dumps are always found in public open spaces as well as in developed pieces of land located not far from existing residential areas.

In view of the above, it is recommended that municipalities should introduce a group of environmental officers who will be required to patrol all hotspots areas with the aim of discouraging offenders from continuing with illegal dumping. These people should be trained and be empowered with the authority to issue spot fines for offenders. Similarly, municipalities may utilize the services of their law enforcement division or traffic officers to ensure that mobile vehicles do not litter all over the area. Basically, this strategy can be used to address the problem of littering by pedestrians as well.

5.4.6 Composting of Waste

It is recommended that all municipalities should start making compost from organic waste collected as this will help reduce the volume of waste to be carried to the landfill site, the saving of airspace and funds to purchase cover material. This has become a scare commodity in the Sedibeng District Municipality and it will also help in the reclamation of valuable pieces of land that can be used for other community purposes.

5.4.7 Promotion of Separation of Waste at Source

Too much waste is taken out from different households and much of the waste is a combination of wet waste from the kitchen and dry waste such as papers and plastics. Separation of waste at source is coupled with some advantages whereby waste reclaimers collecting waste during scheduled kerbside collection will manage to obtain some material to sell to buyers while the waste volume destined for the landfill site will be drastically reduced. Separation of waste at source is encouraged as the buyer can buy recyclables at different prices and can enter into contract with many waste reclaimers at different places to collect separated waste.

It is therefore recommended that all municipalities should encourage residents to become involved in the process as this will help in the reduction of waste volume. In this way, lesser numbers of trucks will be required for the service and more money will be saved.

5.4.8 Public Private Partnership

Waste management equipment had become too much expensive to acquire and with the poor rate of service payments, the acquisition of these machines will be a dream. It is recommended that partnership between the municipality and private companies, can bring stability in the provision of quality service because there will be sufficient equipment for the provision of the required service. A good example of this partnership is Pikitup waste management company in the Johannesburg Metropolitan area and the Metsi-a-Lekoa water utility company in the Emfuleni Local Municipality where funds were pumped in from both the municipality and the partnering private company.

5.4.9 Promotion of Bulk Containerization Service

Bulk container service in the Emfuleni Municipality is performed by a private company whereas the same service is rendered by the municipality in both Lesedi and Midvaal Municipalities. The outsourcing of this service was based on non-availability of funds to replace old bins and the purchase of skip trucks. In order for the municipality to acquire funds from this type of a service, they need to promote the service including the re-introduction of such a service that will be coupled with some advantages and better benefits. There should be a stiff competition amongst service providers and this could lead to the reduction of prices which will benefit the community at the end.

5.4.10 Environmental Liability

Different forms of waste are found dumped in open spaces and some of them are toxic and are not supposed to be dumped in open and unprotected places. Illegal dumping can lead to environmental pollution that could ultimately affect the water sources. Environmental liability entails the prospects of one being held liable for the potential environmental damage that one has caused.

It is recommended that municipalities should formulate charges that must be promulgated in the By-Laws that will be used to prosecute offenders to rectify the problem they cause. In other words, funds to repair the damage caused will be borne by the offender. The action of holding one liable could become a deterrent tool that will make possible offenders to refrain from proceeding with wrong deeds.

5.4.11 Waste Recycling

It is recommended that all municipalities under the Sedibeng Municipality should get involved in the recycling of waste and they should establish a wing within their organogram that will be responsible for recycling of waste as part of sources of income for the municipality. This recommendation is not against any Standing Order hence it is seen as feasible for introduction of such service. When more waste is recycled, it is an indication that lesser money will be spent in the management of waste to be deposited at landfill sites because it will be less.

5.4.12 Reclamation of Carbon Credits

Several studies were conducted for various municipalities regarding the reclamation of carbon credits and many of them have shown the potential to generate the required gas. In a landfill site, organic waste is decomposed by micro organisms that generate billions of cubic of methane gas. This type of gas is also known as natural gas and this can contribute to global warming if allowed to escape into the atmosphere. Because of the importance of this type of gas, it is recommended that municipalities should try to protect this gas from getting into the atmosphere by means of extracting gas for other uses.

5.4.13 Disclosure of Information

The Sedibeng District Municipality is an industrial hub for the Gauteng Province and waste related problems vary from industry to industry. In view of the above, it is recommended that the municipality as the custodian of the environment need to ensure that its environment is protected from various pollutants that can emerge from these industries. Municipalities need to ensure that they know what is being manufactured in all these industries as well as the type of by-products that are generated.

It is further expected from municipalities to determine from these industries whether there are mechanisms implemented control the type of waste generated. Recently, it has become compulsory for companies to disclose what they manufacture and the type of by-products they release to the government while any extension or alterations to existing

structure as well as building of new industries, are subjected to Environmental Impact Assessment processes.

5.4.14 The Need to Promote Waste Minimisation

Parts of the waste generated in industries, end up in our rivers while others are found along the roads and open spaces and lead to pollution at the end. In terms of the Minimum Requirements for Waste Disposal by Landfill of 1998 it is imperative that there must be a reduction in the generation of waste because that prevention is better than cure. In other words, it is easy to generate waste but it will be difficult for one to clean the problem created. In order for the government to sustain this objective, it is recommended that municipalities with their expert knowledge on the management of waste need to spearhead the move to reduce waste by all means from the production point.

Municipalities need to assess types of by-products that are generated as this process can help to identify a second company through the Industrial Waste Exchange Programme where companies that might be interested in using the said by-products could be identified. It is further recommended that municipalities should help to resuscitate the industrial waste exchange programme where different companies registered their products including their by-products as this will help to determine primary and secondary users of such products.

It may be noted that the need to minimise waste from all sources, seek to address the problem of pollution to the environment which was enshrined in Section 24 of the

Constitution where it was highlighted that the lives of the people and the environment should be protected. In terms of the White Paper on Integrated Pollution and Waste Management for South Africa (2000:29) waste minimization was referred to as measures adopted by municipalities to ensure successful implementation of waste minimization strategies and initiative which include:

- Developing mechanisms for promoting cleaner production technologies and innovative treatment strategies and disposal option,

- Developing mechanisms to set target for minimising waste and pollution at source,

- Separation a recovery of resources as early as possible in waste-generating processes in both commercial and domestic sectors, and

- Resource recovery at waste transfer station, waste treatment facilities and was disposal facilities.

5.4.15 Converting Quarries to Gardens and Sports Fields

In areas that are fully developed there are no spaces that can be utilized for sports fields, parks and community gardens and this situation deprive children a place to play. Quarries that are found at the backyard of many residential areas are always found in a bad shape or neglected where all forms of waste are found deposited. It may be noted that quarries

are areas that were created during the excavation for soil for building of roads and houses.

5.4.16 Extended Product Responsibility

Old tyres are always seen thrown all over with the result that negative results such as veld fires and pollution of the environment through fire often occurs. Companies manufacturing these tyres should be held liable for their product and this can become possible if a decision to do so can be taken. Extended responsibility will equally help in curbing of imported goods that are dumped in the country with no definite purpose

5.4.17 Separation of waste at source

Waste management practices in the Sedibeng District Municipality must minimise and avoid the creation of waste specifically referring to waste reclaimers when doing kerbside recycling, when separating waste at source (kerb) and promote safe disposal of none recylable waste. It is further recommended that residents should take part in separating waste at source by separating recyclable waste from none recyclable ones. This will result in two bag system.

5.4.18 The importance of community education

Education is a critical factor that needs to be seriously considered in planning and operating a waste management programme as it is on one hand a key element in

determining economic performance and equitable income distribution in the long term. It is recommended that the Sedibeng District Municipality adopt strategies to implement community education to teach residents of better methods to handle waste.

5.4.19The importance of media in waste management

It is recommended that proposed strategies and policies to curb the problem of illegal dumping should be made known to all people through media, community meetings and municipal newsletter because most of the dumps occur in places that indicate that the culprit might have been ignorant of health status of others.

5.5 RECOMMENDATION FOR FURTHER RESEARCH

As the findings of this research are based on the waste management practices of the three local municipalities under the Sedibeng District Municipality there is a need to conduct more empirical field surveys on waste management functions in other municipalities. This suggestion is based on the fact that there are bigger municipalities called Metropolitan councils with more resource and functions that render the same function in a much bigger way than local municipalities. If the comparison of these practices from these municipalities can be done, it can become clear to practitioners to determine which best route can be followed by all municipalities, in the management of waste.

5.6 CONCLUSION

Recommendations that were provided include: adoption of polluter pays principle; upholding of cradle to grave principle; the importance of public participation and community education; developing and legalizing of landfill sites; introduction of environmental inspectors; composting of waste; promotion of separation of waste at source; private public partnership; promotion of bulk containerization service; environmental liability, waste recycling; reclamation of carbon credits; disclosure of information; the need to promote waste minimisation and the conversion of quarries into agricultural and sport fields.

On the basis of findings and recommendations, the following conclusions are deduced:

- The problem of uncontrolled urbanization processes in the Sedibeng District Municipality has resulted in the emergence of too many informal settlements as well as a lot of low cost houses in sparsely populated areas. This has resulted in poor service delivery as those new areas were not budgeted for and can therefore not form of part of the collection schedule.

- Most of the people within these municipalities are aware of problems of non-existence of By-Laws that can be used for prosecuting offenders neither do they have boards cautioning people not to dump hence, waste is dumped all over.

- Waste management services form a core function of municipal services and cannot be sustained without community cooperation and participation in all operations. The system designed for the implementation of the programmes should be user friendly and sustainable. The understanding of the demographic characteristics of communities within the local municipalities` operational area is vital for the delivery of accessible, affordable, relevant, acceptable and effective services.

- If poor waste management practices by residents which include illegal dumping of waste continues, there will be long term effects of pollutants entering the surface or groundwater resources, air and soil which will affect the fitness to use and availability of the resources.

In conclusion, it is noted that objectives for the study were realized, and recommendations for the management action and for further research flowed from the findings of the study.

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5.8 ANNEXURES "A"

QUESTIONNAIRE FOR WASTE MANAGEMENT OFFICIALS.

Name of the Respondent.....

Institution employed.....

Position held.....

Contact numbers.....

Email Address.....

Questions

1. How is your municipality demarcated with regard to cadastral boundaries?

2. How many households units do you have in your area?

3. Do you have any informal settlements in your area and if so, what types of services do they receive from municipality?

4. As an official, are you satisfied with the type of service that is rendered in your municipality and if no, what could be the problem?

5. Does your municipality own any waste transfer stations or mini dumps and if so, how do you service them?

6. How is toxic and medical waste handled in your municipality?

7. How many landfill sites does your municipality have and how are they serviced e.g. either by council or private?

8. Are your landfill sites licensed and if not, what could be the problem?

9. What kind of problems do you experience when managing landfill sites within the area of your jurisdiction??

10. How are problems of illegal dumping, handled in your municipality?

11. Has your municipality entered into any service partnership with private companies around your area and if yes, what type of relationship do you have with them?

12. Do you have any waste recycling centers or buy-back centers in your area and if so, who owns them?

13. It is known that there are waste reclaimers in your different waste disposal sites; how do you control them?

14. Given a chance to decide, what can you do to bring the problem of the management of waste under control in the near future?

15. How are By-Laws on Waste Management implemented in your municipality?

ANNEXURE "B"

QUESTIONNAIRE FOR COUNCILORS

Name of Respondent.....

Institution (Municipality).....

Ward No.....

Contact Numbers.....

Email Numbers.....

Questions

1. Do you know how many household units are there in your ward, population figures as well as the demarcation points of your ward boundaries?

2. Do you have any squatter camps in your ward and as a councilor what type of assistance do you offer them?

3. Do you have an idea what the concept Waste Management entail or mean?

4. Is there any house to house waste collection service rendered in your ward; how many times is rendered in a week; you satisfied with it?

5. Do you have an idea what waste recycling is all about; as a councilor, in what ways are you involved in such waste recycling activities?

6. Do you see the importance and benefits of waste recycling in your ward?

7. How do you enforce provisions of By-Laws in your ward or is matter beyond your reach?

8. As a councilor, what seems to be a serious problem with regard to the management of waste in the municipality as a whole as well as in your ward?

9. In your opinion, what is the best method that can be applied by the municipality that can help bring the problems of increased waste volumes in different wards under control?

10. Do you see the current waste management activities in your ward as effective enough to sustain environmental cleanliness as prescribed in legislation and if no, give reasons why?

11. Given a chance to decide for the municipality, what changes can you recommend that could help bring problems such as illegal dumping and the generation of excessive waste volumes under control?

12. How is the concept of environmental cleanliness promoted in your ward and who are the stakeholders?

13. How do you address the problem of builder's rubble and green waste that are generated in your wards?

14. How often do you hold meetings in your ward in an attempt to address problems related to the management of waste?

15. In your opinion, do you see any future improvement in current waste related problems generated in wards?