

**AN EVALUATION OF THE GAPS AND BARRIERS IN IMPLEMENTING THE NATIONAL
WASTE MANAGEMENT POLICY AND ITS IMPLEMENTATION IN FORMAL AND
INFORMAL URBAN AREAS IN EKURHULENI MUNICIPALITY, SOUTH AFRICA.**

BY

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I declare that **AN EVALUATION OF THE GAPS AND BARRIERS IN IMPLEMENTING THE NATIONAL WASTE MANAGEMENT POLICY AND ITS IMPLEMENTATION IN FORMAL AND INFORMAL URBAN AREAS IN EKURHULENI MUNICIPALITY, SOUTH AFRICA** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

SIGNATURE
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ABSTRACT

Waste management is a global challenge due to high waste generation resulting from high industrialization, urbanization and challenges relating to the efficient implementation of waste management policies acts and standards. Although South Africa has established a number of good waste management policies and related acts and standards, most municipalities still find it challenging to efficiently implement waste management strategies. Ekurhuleni Municipality is facing challenges with the implementation of effective waste management strategies and compliance to the National Environmental Management Waste Act (2008), (NEMWA) (Act No 59 of 2008). An evaluation of the gaps that exist between NEMWA and the local implementation in the formal and informal parts of the Ekurhuleni Municipality was undertaken in this study. Data on the waste management scenario as collected through questionnaires, interviews and observations revealed that differences relating to the poor establishment of an integrated approach to waste management exist between NEMWA and the local implementation of the act. This was realized through the fact that there is limited community education on waste management, no waste recycling facilities in some residences, irregular and insufficient collection of waste and non compliance with tariff payments for most informal residents and some formal residents. Differences also exist in the waste management strategies between the formal and informal areas of the municipality primarily due to the fact that the informal settlements are mostly unplanned and considered illegal. According to this study, informal residents are not billed for waste management services and as such most of them do not pay for waste management services. To that end, waste is not efficiently managed due to municipal financial constraints. Waste management challenges in Ekurhuleni Municipality are also attributed to lack of or insufficient knowledge regarding sustainable waste management practices and its benefits amongst the waste generators and some waste management employees.

Key terms:

Integrated Waste Management, National Environmental Management Act, Informal Settlements, Waste Management Policies, Waste Management, Waste Disposal, Landfill.

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DEDICATION

This work is dedicated to my son, MUFU JUNIOR TEMBON who was born mid way in the course of this study and yet I could still meet all my deadlines. He is an understanding boy and MY BOY “I hope you will grow up to be very hard working irrespective of the different challenges in life”.

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LIST OF ABBREVIATIONS

ACRONYM	MEANING
ARC	Agricultural Research Council
CoJ	City of Johannesburg
CTMM	City of Tshwane Metropolitan Municipality
DEAT	Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Tourism
EfSE	Education for Sustainable Environments
EMF	Environmental Management Framework
EMM	Ekurhuleni Metropolitan Municipality
EPWP	Extended Public Works Programs
GPIWMP	Gauteng Provincial Integrated Waste Management Policy
IWM	Integrated Waste Management
IWMP	Integrated Waste Management Plan
IWMSA	Institute of Waste Management for Southern Africa
MEC	Member of Economic Council
NEMWA	National Environmental Management Waste Act
NWMS	National Waste Management Strategy
SA	South Africa
UK	United Kingdom
UNDP	United Nations Development Programs
UNESCO	United Nations Education Scientific and Cultural Organization
WCAs	Waste Collection Authorities
WRDM	West Rand District Municipality

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CHAPTER 1

1.1 INTRODUCTION AND STUDY BACKGROUND

The environment has many dimensions as stated in the Van Rooyen model of Education for Sustainable Environments (EfSE), (Van Rooyen, 2006). These include the biophysical, social, economic, political, scientific / technological, contextual and the personal dimensions. The interactions of these different dimensions will lead to either the degradation of the environment or the sustainable management of the environment. However, the effects of environmental issues associated with their respective management issues like waste and its associated problems can both be identified and solved through some or all of the different environmental dimensions according to their respective capabilities. This study evaluates the challenges associated with waste management in some parts of the Ekurhuleni Municipality with respect to partly the analysis of the South African (SA) National Environmental Management Waste Act's, Act No. 59 of 2008 (NEMWA's) recommendations. It further focuses on evaluating management differences that occur between the informal and formal settlements of the same geographical area. It also elaborates on possible solutions to address these issues.

It is imperative to note that waste management issues can occur in different contexts (Oelofse and Godfrey, 2008). Waste is generated in both formal and informal residential contexts thus waste management needs to be practiced by the waste generators of both contexts. Although population growth, rapid economic development, land scarcity and inadequate expertise are seen to be some of the major challenges faced by the less developed countries with respect to efficient waste management practices, waste management remains an important activity within societies (Manaf *et al* 2009). Waste can be managed differently depending on the source of waste generation and the kind of waste generated. However according to Manaf *et al* (2009), a typical solid waste management system in developing countries faces many challenges from the angles of waste collection services, crude open dump sites existing and burning of waste without any air or water pollution control. It is therefore imperative that waste management practices be legally protected to obtain efficiency in such practice. Waste being waste, must be managed efficiently and sustainably. The NEMWA together with related policies and standards should be the main focus where waste management practices are

measured in South Africa. Individual view points are also a typical avenue for inefficiency in waste management practices. Gentil *et al* (2011) elaborate on the how social and behavioral aspects of different individuals may negatively affect waste management. Every individual therefore needs to be exposed to the relevant legislation that caters for waste management for example the SA NEMWA. NEMWA came into effect on the first of July 2009 after the notice was made in the SA Government Gazette on the 30th of April of the same year. NEMWA provides national guidance to issues on waste management. According to NEMWA, waste management practices are systemic with cooperative governance where the different government spheres (the political dimension) have a role to play in sustainable waste management. The national norms and strategies (political dimension) for waste management (social dimension) as stated in NEMWA (political dimension) were set aside by the minister (biophysical dimension) 2 years after the act was made public in the gazette. Although these norms and strategies may be differentiated with respect to the different geographical areas (contextual dimension) and different categories of waste (social dimension), all the organs of states (political dimension) and all persons (biophysical dimension) must abide to the strategies and norms. It is therefore vital that the environmental and waste management acts and related policies attempt to answer the following questions:

How is waste managed sustainably?

When should waste be managed sustainably?

Why should waste be managed sustainably?

What waste should be managed sustainably? And,

Who should manage waste sustainably? Although some of these questions have been answered through NEMWA and the different integrated waste management plans, the waste management sector still faces some challenges in many South African Municipalities (Baloyi, 2011), including the Ekurhuleni Municipality. This study therefore investigated the gaps that exist in the implementation of waste management strategies and what is stipulated in NEMWA. It also focused on the evaluation of the differences that exist in the implementation of waste management strategies between the informal and formal parts in some areas of the Ekurhuleni Municipality.

A national waste summit hosted by the Department of Environmental Affairs and Tourism in Polokwane – South Africa in 2001, came up with what is known as “The Polokwane declaration”. The Polokwane Declaration was aimed at prioritizing waste management for more protective environments, by stipulating how this can be achieved through its visions and goals. This declaration on waste management was made based on the fact that waste management strategies need to contribute to sustainable development by harnessing the energy and commitment of all South Africans for an effective waste reduction. As a result there is the need for urgent action to reduce, reuse, and recycle waste in order to protect the environment. It also sets out as a goal that the amount of waste generated and disposed should be reduced by 50% and 25% respectively in 2012 and 2015 and even to zero waste by 2022 (Polokwane Declaration 2001). During this summit, activities were identified which should be implemented by local governments in order to achieve the goal. The following action plans were agreed upon to be implemented by the national, provincial and local governments:

1. Develop and implement a comprehensive legislative and regulatory framework by June 2002.
2. Implement the National Waste Management Strategy (NWMS).
3. Build capacity within all spheres of government.
4. Promote strong intergovernmental coordination and cooperation.
5. Develop an Information Management System by April 2002.
6. Explore and support appropriate economic instruments to support the NWMS.
7. Set up a multi stakeholder forum consisting of national, provincial, local government, business and civil society.
8. Promote and implement sustainable poverty relief projects.
9. Provide comprehensive waste management services.
10. Explore the establishment of a National Waste Fund.
11. Develop compliance monitoring mechanism and

12. Develop comprehensive communication strategies including mounting campaigns (Polokwane Declaration, 2001)

The Ekurhuleni Municipality is implementing most of these guidelines as it has its own legislative and regulatory framework, (Ekurhuleni Municipality by-laws and waste management framework 2002). Although these are being implemented, a lot of pressure still exists on municipal waste management due to the following:

- an increased demand for waste management services like storage, collection, disposal and even treatment facilities,
- increased demand for waste minimization strategies,
- the demand of facilities that will pose less health risks to use as land fill sites, and
- lack of capacity for effective governance for example the poor or lack of enforcement of municipal laws.

The Institute for Waste Management in Southern Africa (IWMSA: October 2011), also reiterated these challenges. According to the e-news reporter, (Muangana, e- news reporter, June 2nd 2011) many rural and squatter settlements are finding it very difficult to have their waste properly managed by the local municipalities due to lack of facilities and infrastructures like proper roads for the trucks to travel on to collect the waste. It was also reported on e-news that there is a lack of skilled municipal waste managers in most municipalities (Muangana, e- news reporter, June 2nd 2011), a fact also echoed by IWMSA (IWMSA, Eastern Cape 2011). To help with waste management in the squatter and rural settlements, pilot studies are conducted and awareness is being raised within some SA municipalities whereby a central disposal point is provided for all the rural and squatter residents and collection done on a fixed day every week (Muangana, e- news reporter, June 2nd 2011). The Ekurhuleni Municipality is also facing challenges with waste management strategies mostly within the squatter settlements where lot of unattended rubbish is usually found piled in front of these residences as seen in figure 1.1.

While municipalities are expected to embark on extensive waste minimization to ensure zero waste to landfills, most SA municipalities seem to be lagging behind on this aspect. Luitel *et al* (2008) reported that most municipalities are only interested in waste collection and dumping with no initiative of minimizing the generated waste. From their studies on municipal waste

minimization strategy in Napel, Luitel *et al* (2008) found out that residents of the poor urban but informal settlements have no or very limited knowledge with respect to waste minimization techniques and they feel the impact of poorly managed waste within their residences. Recent studies carried out by the CSIR (2011) on municipal waste management in SA show an improvement on waste management services offered by some municipalities. For example, the CSIR (2011) studies on waste management good practices show that the City of Johannesburg provides households in informal settlements with black refuse bags to use as waste receptacles (CSIR, 2011). According to the CSIR (2011), the SA Treasury allocates a budget for municipalities to carry out such waste management initiatives within the various informal residential areas. The CSIR (2011) also found out that the City of Johannesburg Municipality does a daily cleaning in its informal settlement areas and it is in the process of converting a closed landfill site into a waste drop –off centre. Although other municipalities are improving on their waste management practices in the informal areas, the Ekurhuleni Municipality does not seem to be taking on any such waste management initiatives within its informal residential areas.

As the rate of resource usage increases following population increase the production of waste, influenced by the rate of population increase also increases (CSIR, 2011, Luitel and Khanal, 2010). In developing countries, the trend is that people have migrated from rural areas to the urban areas in search of jobs and higher standards of living. This has led to the formation of informal settlements due to the lack of accommodation and even the lack of space to construct residential houses. This forms one of the major barriers to an inclusive modern waste management system (Ogutoyinbo, 2012). For example, different individuals will think of waste management differently since they may not be exposed to the same waste management instruments. This demonstrates the inflexible nature with which individuals may think of waste management (Seadon, 2010), thus negatively impacting on waste management strategies. Immigrant informal dwellers turn to see scavenging from landfill sites as a source of income while others will see it as an aesthetic problem due to the litter that accompanies scavenging (Ogutoyinbo, 2012).

It is worth noting that, in Brazil, informal settlements called 'Favelas' began as precarious settlements with cardboard and tin dwellings but with an increased sense of permanence and

legal security, residents upgraded their dwellings and most are now brick and concrete, Harrison, in Davies (2008). Upgrading and formalizing informal settlements in cities in Brazil therefore led to urbanization which increased the problems related to waste management.

Visser (2008) comments about the successes of the Johannesburg's Extended Public Works Program (EPWP) initiated to create unskilled jobs. This program led to massive increases in jobs within the Gauteng province. Many informal (squatter) settlements exist in the Ekurhuleni Municipality most probably due to its highly industrialized nature (Mungoshi, 2010). The migrants into the area who make use of these settlements most probably aimed at seeking skilled and unskilled potential job opportunities from the industries.

According to the Dickinson (2012), overpopulation can be viewed as "the condition of having a population as high as to cause environmental deterioration that leads to social and environmental problems whereby the carrying capacity is exceeded". Overpopulation in the Ekurhuleni Municipality is experienced as the carrying capacity of the municipality is exceeded through the shortages of formal residences which negatively impacts on the service delivery to the informal residents (Ekurhuleni waste manager). There are about 105 informal settlements in the City of Ekurhuleni and most residents in the informal settlements are undocumented, making it difficult for the city to provide services including waste management services (Mungoshi, 2010). The Ekurhuleni Municipality has no proper policies on how to manage these informal settlements as they thought in the beginning they were just temporary solutions to housing. However, due to the growth of these settlements it has now become clear that they have to develop capabilities to manage them systematically (Mungoshi 2010). Notwithstanding, residents of these informal settlements remain illegal settlers who are deprived of most of the usual rights of access to the city and its benefits such as proper waste management. Waste management rights amongst others are therefore not common within squatter settlements in the Ekurhuleni Municipality. According to the revised free basic services and indigent support policy (2011), access to basic services is ensured for all indigents qualified according to the South African constitution. Amongst the different services specified, includes a discounted rate for the basic services of refuge removal. This discounted rate, although applicable only to indigents whose electricity current supply is limited to 20ampere, an application must be supplied to be eligible for such benefits. Even though this

meant for all to receive basic services, the informal settlers are still not privileged to receiving waste management services probably because they have not been educated on the policy and its terms or they simply do not qualify to apply or they are negligent and have not applied for such benefits. However, the South African strategy for sanitation services for Informal settlements (2007) reveals that waste disposal practices within informal settlements must be assessed and unsafe practices be identified so as to provide measures that will be relevant in the prevention of disease and environmental pollution from such practices. The piles of rubbish in front of the Marathon squatter settlements as shown in figure 1.1, is an indication of the fact that the South African strategy for sanitation services for informal settlements is not being implemented or there are no monitoring strategies for irresponsible waste management practices in informal settlements within the Ekurhuleni Municipality. The Ekurhuleni Municipality Framework (EMF, 2007) guides the municipality's activities including its waste management; but the existence of squatter settlements has increased the rate of waste production resulting into challenges of waste management. The photograph in Figure 1.1 demonstrates the extent to which waste production has increased due to squatter settlements. There are heaps of rubbish at the front of the settlements and by the road side.



Figure 1.1: Unattended rubbish in front of the “Marathon” informal settlement in Germiston. (Researcher, April 2012)

It is therefore a fair assumption that the waste management strategy or by-laws within the Ekurhuleni Municipality’s EMF is either not being properly implemented or there are insufficient or inefficient monitoring strategies in place. This again supports the goals/objectives and needs for this study to be carried out.

Other cases of over population and lack of municipal intervention brought about by the existence of informal settlements that lead to waste management challenges are common in other African countries. For example, in Kenya;

- Current investment and budget allocation for sanitation sector is inadequate.

- There is a huge disparity between resources available, and improved basic sanitation and hygiene sanitation, and
- Practical and sustainable delivery mechanisms for sanitation services in informal settlements are not yet developed (Osinde, 2006).

According to Hart (2011), the Member of Executive Council (MEC) for housing in the Ekurhuleni (Metropolitan) Municipality urged all to take a stand against waste during a sensitization process of the public on waste management practices within the municipality to ensure proper waste management by all. With piles of rubbish in the informal settlements building up, the Ekurhuleni (Metropolitan) Municipality has decided to tackle the matter hands-on and the MEC led a team of officials on a cleaning campaign aimed at not only clearing rubbish, but finding a permanent solution to solid waste challenges faced by informal settlements in the municipality (Hart, 2011). However, despite all these efforts, waste management still remains a problem in squatter settlements within the Ekurhuleni Municipality. Hart (2011) also mentioned in her report that the Ekurhuleni's executive mayor and her team of MECs and other senior officials have been conducting site inspections at various projects to monitor progress and intervene where necessary. Considering the goals set by the MEC for housing in the Ekurhuleni Municipality, it is vital that a research is carried out to investigate the processes in place for sustainable waste management and if there are any gaps, challenges or barriers in accomplishing the aims of the MEC.

Knowledge concerning the legal control of waste, the treatment of hazardous waste and the formal short-term and long-term waste management policies form the basis for efficient waste management decision making. With the assumption that everything is waste (Oelofse and Godfrey, 2008), there are no societal or environmental activities that can be effectively carried out without the generation of waste. Therefore the need to have rules or monitoring strategies and risk management factors in place to manage the waste generation activities is imperative. This can be done by developing new waste management policies or adopting and implementing existing policies. Although individual viewpoints might vary when it comes to implementation methods which might pose as a risk factor, NEMWA stresses on the co-operation amongst the different parties concerned in waste management practices and cautions that education of the public is imperative since the Act is a “system of co-operative

governance” (NEMWA, Act 59 of 2008). In the case of the EMF (2007), no risk management practices have been identified in the framework, to, for example: cater for waste generated by inhabitants of the newly created squatter settlements and strategies in educating the public on waste minimization. In another view, Beukes (1994) looks at how efficient policies from foreign countries can be implemented unchanged or adapted to local circumstances but notwithstanding; identifying preventative plans of action to avoid failures. Since legislation is usually not well implemented by some stakeholders, it is important that the waste manager realizes and acts upon his or her ethical responsibilities towards nature.

1.2 JUSTIFICATION OF THE STUDY

Sustainable living and development through waste management can be viewed as one of the world’s greatest challenges (Annan in UNESCO, 2005). According to Scott and Gough (2003), the problems faced by humanity are essentially environmental, e.g., waste production and management, and can be understood through science and resolved by appropriate environmental and /or social actions incorporated by technological knowhow. Mismanagement of environmental wastes could lead to serious implication of those whose job is to maintain some ideal state of the environment (Hill *et al*, 2006).

The NEMWA has a prescription of certain national norms and standards with regards to waste management to be implemented by the different municipality as stipulated during the National Waste Summit (Polokwane Declaration, 2001). The norms and standards of NEMWA, indicate that the Minister of Environmental Affairs can publish notices through the government gazette which amongst other notices include the classification of waste.

The Ekurhuleni Municipality was created on the 5th of December 2000 and is the 4th largest municipality in South Africa consisting of about 2.5million inhabitants (SA census, 2001) with about 1.75 million residents over the age of 18. The Municipality has a population density of about 1250 people per square kilometer and was said that it would be one of the most densely populated areas in the country by 2007 (SA census, 2001). Waste management can be seen as a challenge in certain parts of this municipality, and high population is most probably why there are a lot of challenges with the collection of waste even though pre-planned waste management exists.

Signs of dissatisfaction from community members of the formal residential areas in Ekurhuleni with respect to how waste are managed by the local council authorities have been raised by so many individuals as communicated within a newspaper article (*Germiston city news* March 26th 2009). For example, there were reports on rubbish being left unattended to for more than a week outside residents' homes in the Lambton – Germiston area and even on surrounding pavements where residents have now termed these pavements “a disgrace, (*Germiston city news* March 26th 2009)”. Dogs in turn take advantage of this and scavenge thus causing another level of environmental pollution.

The South African National Constitution (Act 108 of 1996) stipulates that everyone has the right to an environment that is not detrimental to their health (SA constitution Act No 108, section 24). Even though the constitution is meant to be implemented equally on all South African citizens; with their responsibility accounted for, most inhabitants within the squatter and the more rural parts of the Ekurhuleni Municipality feel their waste is not properly catered for as compared to how waste is being managed within the more urban parts of the same municipality (*Germiston city news*, March 26th 2009). This challenge forms part of the reasons why this study was carried out, highlighting the difference of waste management in the formal and informal parts of Ekurhuleni.

Integrated waste management plans are a recommendation for all municipalities with respect with respect to efficient waste management. According to DEAT (2007), although most municipalities have an Integrated Waste Management Plan (IWMP), there are still some challenges with regards to having a shift from an end-of-pipe waste management scenario to waste reduction scenario. These challenges have been identified to be due to the lack of capacity and knowledge to efficiently carry out an integrated waste management strategy. Godfrey and Oelofse (2008) reiterate this fact by confirming that the waste management challenges in the SA municipalities include insufficient budget, capacity and equipment. This was again supported in the work of Oelofse *et al* (2010) on the issues associated with waste management service delivery, and that most of these challenges come from the area of household waste collection with the biggest backlog in the rural and informal settlements.

Amongst other things waste management needs to be sustainable in order to achieve the type of environment that is not detrimental to people's health. The National Waste Management Strategic projects are meant to be, but not limited to the development of strategies for integrated waste management and the action plans to implement the identified strategies (NEMWA Act 59 of 2008). These strategies serve as the responsibilities of the implementers if they are to achieve the rights to a healthy and detriment-free environment. Hence if these strategies are meant to be integrated, it reflects on the fact that generators of waste should not be entirely separated from the managers of the same waste.

1.3 THE RESEARCH QUESTION

The main research question on which this study was based on is: **What challenges does the Ekurhuleni Municipality face while implementing the National Environmental waste Management Act and what is the difference in the implementation between the formal and informal areas in the municipality?**

The following are the sub questions that were used to collect the data that provided the results, the recommendations and the concluding remarks made in this research:

- What are the gaps between the national policy and local implementation with respect to waste management in the Ekurhuleni Municipality?
- What are the causes of the gaps?
- What are the possible plans of action that can be used to address the gaps?
- Are there any differences in the implementation of waste management strategies between the formal (medium and low density areas) and informal settlement areas of the Ekurhuleni Municipality?
- If there are, what are the possible causes of the differences in the level of implementation of waste management practices by the Ekurhuleni Municipality?

1.4 THE RESEARCH HYPOTHESIS

- There are gaps in the waste management practice within the Ekurhuleni Municipality due to the challenges faced in implementing the National Environmental waste management act, Act No. 58 of 2008.
- The formal medium density areas within the Ekurhuleni Municipality have more privileges as they benefit more from the waste management services provided by the municipality compared to the formal high density areas and the informal squatter areas within the same municipality.

1.5 OBJECTIVES OF THE STUDY

The objectives of this study were:

- To investigate the existing waste management practices in designated areas of Ekurhuleni Municipality and evaluate the problems associated with the implementation of effective waste management strategies.
- To evaluate if gaps exist between the NEMWA, Act 59 of 2008 and the local implementation of waste management strategies through the analysis of the data collected through interview and / or questionnaires issued.
- To analyze the causes of the gap(s), if any, through the critical evaluation and analysis of the data collected in relation to the causes of the gap(s) from both the local community members and the municipality waste management workers.
- To find out if there exist any differences in the implementation of waste management strategies between the formal and informal areas of Ekurhuleni Municipality and if there are, an evaluation of the causes will be made.
- To recommend the possible plans of action that could be used to address any existing gaps.

1.6 CONCLUSION

Municipal waste management continues to be a major challenge in urban areas worldwide that accomplishing effective and efficient municipal solid waste management should be a priority for cities in the developing countries (Jianjun *et al*, 2006). Acts and policies are usually formulated for governments and their local authorities to make use of in ensuring effective waste management. However although guidelines are put in place, waste is still not usually well managed resulting in many different effects of poor or inefficient waste management. The difference in waste management between the formal and the informal parts of a particular municipality, the poor or inefficient implementation of waste management strategies such as those stipulated in NEMWA, can lead to detrimental health conditions amongst the inhabitants and /or poor aesthetic views of the environment.

This study therefore evaluated the gaps and barriers that exist between the National Environmental Management Waste Act and the local implementation in Ekurhuleni by finding out how? when? why? and what waste is being managed.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter examines the different definitions of waste and also gives an in-depth analysis of the concerns around waste; how waste is generated and managed. It also makes an analytical view of some of the acts that are in place in South Africa relating to waste management. These analyses are made in light of the fact that everything is waste and the rate of waste generation is increasing with the increase in industrialization which makes waste management of a huge concern within South African communities and the world at large.

Different definitions are used to define waste. The Minister of Environmental Affairs and Tourism define was as:

Any substance in its liquid, gas or solid state that is discharged, emitted, or deposited in the environment in such volumes, content or manner that will alter the natural state of the environment, a surplus substance or a substance which is discarded, rejected, unwanted or abandoned, any substance that is reused, recycled, reprocessed, recovered or purified by a separate operation from that which produced the substance or any substance that has been identified as waste by any waste related regulation (DEAT, 2007).

The definitions however do not reflect the waste from the mining sector and other radioactive waste as defined by the Department of Minerals and Energy (Status Quo and Waste Minimization Report, 2008). Waste has been redefined in the NEMWA as **“any substance, whether or not that substance can be reduced, re-used, recycled and recovered (a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of (b) which the generator has no further use of for the purpose of production (c) that must be treated or disposed of or (d) that is identified as waste by the minister by notice in the Gazette and includes waste generated by the mining, medical or other sectors but (i) by-product is not considered and (ii) any portion of waste once re-used, recycled and recovered ceases to be waste.** (NEMWA No 59 of 2008).

Adequate waste management is a global concern and most cities in Southern Africa are challenged by the increasing volumes of waste (Hope & Lerokwe, 1999; Oelefse & Godfrey, 2008; DEAT, 2011, Ogutoyinbo, 2012) which can lead to health hazards, smell nuisance, pests, diseases, lowering of property values and other environmental problems if not well managed (Moningka, 2000 and Ogutoyinbo, 2012). According to Hill *et al* (2006), the accusing finger relating to poor waste management usually points at the waste managers. In the same view the municipality workers in the waste management sector of Ekurhuleni are probably taking the blame for the waste management problems that are occurring within the municipality, just as the *Germiston City News* has communicated through the inhabitants' views regarding the management of their wastes (*Germiston City News* of March 26th 2009). However each and every individual must be involved in the sustainable management his/her immediate environment.

According to Luitel and Khanal (2010) waste will remain waste until the recycling and recovering value is more than the cost and labour for the recovery. Responsible waste management practices therefore need to be adequately implemented as it promotes environmental quality thus contributing to sustainability in economic productions (Henry *et al*, 2006) and other environmental dimensions. Waste management measures that include: collection, transportation, processing, recycling, disposal, onsite handling, storage, treatment and the monitoring of waste should be implemented in order to protect the environment (Starkey, 1998). While Gentil *et al* (2011) advocate for individuals to strive and reduce the rate of waste generation which will facilitate the ease with which the different waste management processes are implemented, Ogutoyinbo, (2012) reiterates the same view as he sees the lack of an inclusive waste management system to be a major barrier for an efficient waste management system. Notwithstanding a good waste management strategy cannot be efficiently implemented without having a waste management strategy that emphasizes on the strategic environmental assessment which analyses the impacts of the different environmental activities on the generation of waste (Therival *et al* 1992, Shu & Bazerman, 2010).

Waste generation in South Africa is increasing at a rate that waste management practices are noticeably being affected negatively; (Marthandan, 2007). According to the UN Environmental programs (UNEP, 1998), aimed at assisting developing countries to implement

environmentally sound policies and practices, “prevention is better than cure”. Views shared, during a waste management workshop organized by the Institute of Waste Management for Southern Africa (IWMSA), entitled: *Reviewing the waste Act after a year of its existence* (IWMSA Presentation, Midrand, Feb. 2011), highlighted that the state of the environment in South Africa is deteriorating as the generation of waste is growing fast. This is putting pressure on the balance between the management facilities and the rate of waste generation, for example the Western Cape is running out of landfill site air space (the synthesis report Number 1245 for Western Cape province (2010) and the Gauteng province is also running out of landfill air space and has a shortage of land to use as landfill sites (The SA Department of Forestry (DOF), 2010). Waste will be increasingly generated because of development and the expansion of economic activities as it is the case in many less developed African countries where overpopulation, poverty, urbanization together with unsustainable waste management education are the major causes of increased municipal waste generation (Ezeah and Robert, 2012). The EMM environmental policy points out the fact that the growing population within the Ekurhuleni Municipality is affecting the service delivery such as the provision of housing, water and refuses removal services amongst others (EMM Environmental Policy Reviewed, 2011). Notwithstanding, acknowledgement is made to the fact that basic service delivery is meant to be sustainable (EMM Environmental Policy Reviewed, 2011).

The Ekurhuleni Municipality is only one amongst the many SA municipalities with service delivery challenges such as waste management challenges. Some reasons why there are gaps and challenges in the state of waste management in South Africa include the following:

- The insufficiency of proper infrastructure to efficiently manage the waste.
- Illegal dumping sites. There are about 1149 waste disposal sites country wide of which only 568 of these sites are permitted, the rest have been created illegally as of 2007 (IWMSA, presentation Mid Rand Feb. 2011). These illegal dumpsites arise mostly due to the fact that many municipalities fail to provide the residents with waste storage facilities as it is experienced in many indigent household who cannot afford to buy such receptacles; for example, households from the informal settlement areas (CSIR, 2011). The waste in the illegal dump sites often end up being burnt by the users to create more space.

- Animal and human scavenging.
- Poor management of domestic animals which tend to die on disposal sites during the search for food causing bad odors as the carcasses decompose, and
- Landfill sites are close to residential areas.

In addition to these views on the challenges faced with respect to waste management, it is possible that some communities of South Africa are either not well educated or not educated at all about efficient waste management strategies which in effect negatively affect the health of the biophysical environment. According to statistics of provincial per capita generation of general waste, the Gauteng Province generates the highest amount of waste (DWAF, 1998). This fact has been re-iterated in the Gauteng city-region review document where the province has been identified to generate the most amount of waste compared to other South African provinces (Gauteng city-region review, 2011). It has also been reported that the amount of waste going to the landfill sites can be reduced by about 60%, while jobs can also be created in the process (Gauteng city-region review, 2011). The onus is for the Gauteng Province to strive at implementing the different waste management policies and related acts efficiently.

If waste generation can be considered as in the case of DWAF (1998), then waste management also needs to be planned accordingly. This has been emphasized in NEMWA that municipalities need to develop integrated waste management plans that will be incorporated into Integrated Development Plans (IDP's). The per-capita waste generation is very high in Gauteng due to its affluence nature. This has affected and caused pressure on waste management in the province. The sources of pressure have been recurring since 1998. According to DWAF (1998), the sources of pressure are from the following aspects:

1. Limited refuse removal services in poor areas.
2. Ineffective waste legislation leading to poor or inefficient implementation.
3. Insufficient levels and encouragement of waste minimization within communities.
4. Unmaintained parks which are converted into waste disposal sites by the nearby communities.
5. Poor maintenance of landfill sites due to lack of monitoring measures.
6. Littering in residential areas around streets, taxi ranks and train stations, and

7. Non payment for waste services in some instances, (DWAF, 1998).

Similar obstacles which prevents the Gauteng Province in achieving efficient waste management have been recently identified and associated to the increasing urbanization, commercial and industrial development, limited waste collection in poorer areas, poor enforcement of the waste management laws and regulations, the lack of public encouragement and awareness of waste minimization and the rising oil prices leading to increases in the cost of waste transportation (Gauteng city-region review, 2011). In the case of domestic waste, service provision is assessed in terms of household refuse removal services. A comparison was drawn between statistics collected from the National Census conducted in 1996 and 2001 in terms of service deliveries in with regards to refuse removal, between the different Metropolitan municipalities. This comparison provided evidence that there is a difference in service delivery levels between the different Metropolitan municipalities. This is shown in **Figure 2.1**, where the following six municipalities of the Gauteng Province were studied: Metsweding Municipality, West Rand District Municipality (WRDM), Sedibeng Municipality, City of Johannesburg (CoJ), Ekurhuleni Metropolitan Municipality (EMM) and City of Tshwane Metropolitan Municipality (CTMM).

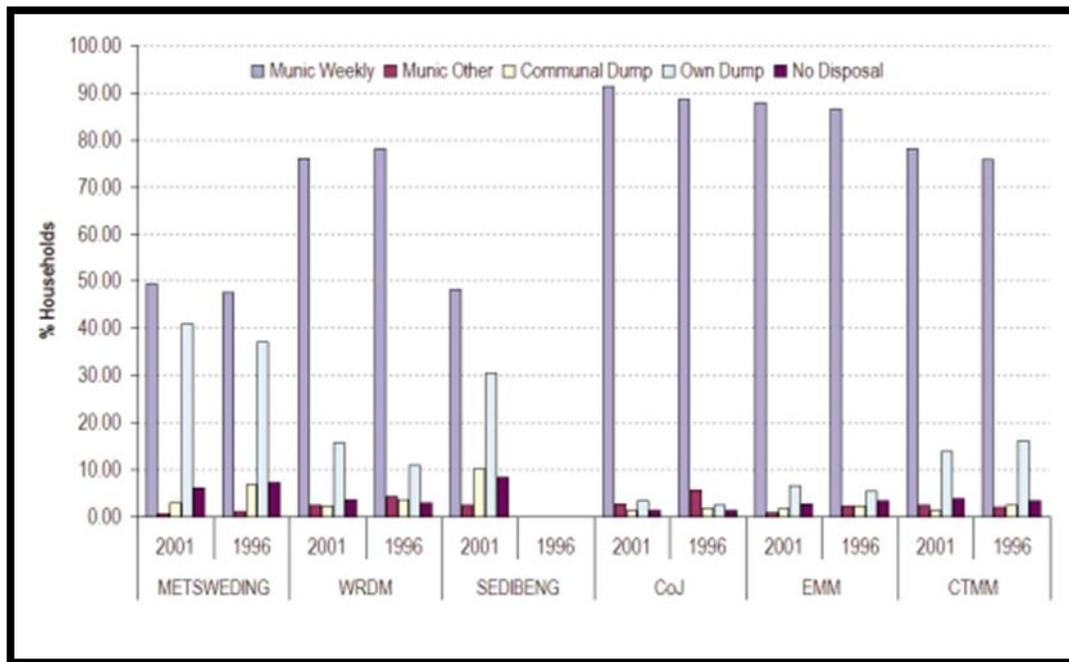


Figure 2.1 Percentage of households with refuse removal services in 1996 and 2001 projected from the 1996 and 2001 census (Enviroserve Holdings: Using indicators to track environmental change, 2004)

Annual household waste production percentages were calculated for these municipalities in the Gauteng province and as seen in **Figure 2.1**, the Ekurhuleni Municipality had the third highest volume of waste disposed at land fill sites compared to the other municipalities, (Enviroserve Holdings, 2004). This indicates that the amount of waste generated is high and is probably increasing within the Ekurhuleni Municipality. One can therefore without doubt realize the need for proper waste management services and monitoring strategies in Ekurhuleni.

Statistics of population increase as shown in the *status Quo reports on waste minimization option* (2008) projects population growth of about 9% from 2006 to 2015 in the Ekurhuleni Municipality as shown in table 2.1.

Table 2.1 Estimate of population increase versus the waste generation model between 2006 and 2020 in the Ekurhuleni Municipality (Status Quo report for Waste Minimization Options, 2008)

YEAR	Population growth model	Per capita waste generated	Domestic waste volume generated	Organic waste volume generated	Recyclable waste volume generated	Builders rubble generated	Total volume of waste generated
2006	2605067	0,53	547200	205200	342000	259920	1354320
2010	2710843	0,53	569419	213532	355887	270474	1409311
2015	2849124	0,53	598465	224424	374040	284271	1481200
2020	2994458	0,53	628992	235872	393120	298771	1556756

It should be noted however that these population growth projections were made from the 2001 census (*Status Quo Reports on Waste Minimization Options, 2008*). Accelerated urbanization in third world countries has led to an imbalance between ecological and economic activities thus an impact on the environmental resource (*Status Quo Reports o Waste Minimization Options, 2008*) which will reduce the carrying capacity for that environment. This can be linked to the case of Ekurhuleni Municipality seeing that there is a progressive increase in its population growth which puts a strain on its basic resource/ service distribution, waste management services inclusive.

The handling of waste has to be guided by waste management legal instructions, rules, and policies or by laws which provide guidelines for the handling. The Ekurhuleni Municipality has put in place by-laws which guide its solid waste management department. The by-laws are focused on the collection and the removal of business, domestic, garden and industrial refuse within the municipal areas of the municipality (EMM Solid Waste By-laws, 2002). The by-laws also provide guidance to the public on how it shall place waste, and how the council workers shall collect and dispose off the waste. Restrictions are also made with respect to private companies and persons who collect the waste from the generated source for economic reasons that before such activity can be pursued; a written permission shall be obtained from the council although this is not necessarily the case, practically.

2.2 POLICIES AND ACTS RELATING TO WASTE MANAGEMENT

According to a far back waste management research carried out by some World Bank Assisted Projects, (1991), most developing countries struggle with the development or the implementation of waste management policies due to “poorly defined institutional structures and responsibilities, poor cost recovery, insufficient technical and managerial expertise, the lack of or insufficient strategic planning” amongst others (World Bank Assisted Projects, 1991). These sentiments have been further echoed in many other studies where most of the findings are focused on a holistic system thinking and integration (Shu and Bazerman, 2010; Zaman and Lehmann, 2011, Oyutoyinbo, 2012). Zaman and Lehmann (2011) went further to explain that strategic approaches to sustainable waste management based on tools, systems, technologies can assist in waste management practices although they must be affordable, practicable and effective within local regulatory frameworks. These ideas are in conjunction with a report by Wilson and Scheinberg (2010), on an international solid waste management (ISWM) system. The ISWM system ensures the following components to be targeted: public health, with a focus on waste collection and street sweeping; environment, with a focus on improving disposal to protect ground- and surface-water and avoid air, water and soil pollution; and resource recovery, to close the loop of both materials and organics management. Seadon’s (2010) view to this is that “waste is as a result of inadequate thinking”. As such, a detailed analysis has to be done and the most sustainable strategies be stated in policy documents for implementation (Zaman and Lehmann, 2011).

South Africa as a nation has a waste management act (NEMWA) together with a number of related acts which serve as guidelines from which the different municipalities have to base their waste management strategies on, depending on their different waste management situations. The different waste situations define the context, in which the waste is generated, collected, treated or disposed off. In understanding the context surrounding waste, the management strategies will also be well formulated or understood (in the situation where it already exists) thus ensuring the effectiveness and efficiency during the implementation of the management strategies. Gouldson and Roberts (2000) comment that not much is usually known by the community members about the municipality’s policies and acts while from another perspective, Shu and Bazerman, (2010) focus on barriers to waste management

created due to the fact that individuals think differently. This study will serve as an investigation on the level at which the Ekurhuleni Municipality waste disposal site workers are exposed to the different waste management policies and implementation strategies. For the purpose of this study the following regulatory documents were discussed:

- The National Environmental Management: Waste Act, 59 of 2008
- The Free Basic Services and Indigent Support Policy Revised July 2011
- The National Domestic Waste Collection Standards February 2011
- The Health Act 61 of 2003
- The Gauteng Provincial Integrated Waste Management (GPIWM) Policy of 2006
- The Environmental Management Framework (EMF) for Ekurhuleni, 2007

The Acts, standards and/or policies serve as a form of responsibility to waste management implementers in order to put an effect to Section 24 of the South African National Constitution. These policies and acts were used to suggest a methodology for undertaking a gap and needs analysis within the waste management sector. The National Constitution for South Africa lays emphasis on proper waste management that will lead to better environments in other words not harmful to health and to maintain sustainable environments through a variety of means with the prevention of pollution (SA constitution, 1996, section 24) inclusive.

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

The National Environmental Management Waste Act (Act 59 of 2008), (NEMWA) as stipulated in the *Government Gazette, South Africa*, provides guidelines on which the different provinces, municipalities, organizations and individuals must adhere to in order to effectively manage their wastes. As preambles, the implementation of the Act leads to the promotion of justifiable economic and social development through; the prevention of pollution and environmental degradation while promoting conservation, securing ecologically sustainable development and securing the use of natural resources. This Act, in Chapter 1, acknowledges that waste management practices in many areas of South Africa are not conducive to an environment which is healthy and the impact of this is “often borne by the poor”. According to this Act, the minister is responsible for setting out national norms and standards for the classification of waste, planning for and the provision of waste management services (chapter

2, part 2, and sub section 1). This is done by putting in notices in the relevant government gazette. Municipalities are therefore required to give effect to the objects of the Act through their different integrated waste management programs, for example providing the requirements for which the different industries within the municipality should develop a waste management plan (chapter 2, part 9, sub section 2/3).

NEMWA was designated with the main objective to promote good health, well being and sustainable environments by providing measures for the avoidance or the minimization of waste, minimizing the consumption of natural resources, promoting sustainable living through recycling, reusing and reducing waste, treating the wastes to render it more environmentally friendly and safely disposing waste as a last resort, preventing pollution and the degradation of the environment, securing ecologically sustainable development while promoting justifiable economic and social development, promoting and ensuring the effective delivery of waste services (NEMWA, chapter 2, part 9). Generally these objectives are aimed at giving effect to section 24 of the National Constitution of South Africa which refers to the fact that:

Everyone has the right:

- a. to an environment that is not harmful to their health or well-being; and**
- b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that**
 - i. prevent pollution and ecological degradation;**
 - ii. promote conservation; and**
 - iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development (SA National constitution, 1996, Section 24).**

NEMWA also aims at ensuring that people (communities) are aware of the impact of waste on their health, their well being and on the environment whereby prescriptions of certain national norms and standards are made with regards to waste management to be implemented by the different organs of the nation such as the municipality. The different types of waste management services and the users of these services need to be clearly differentiated and an affordable tariff in line with the tariff policy in the Municipal Systems Act is to be imposed to

provide for waste management infrastructure or facilities (NEMWA). This is in line with guidelines from the local Government: Municipal Systems Act 32 of 2000 which states in chapter 2 part 4 that the municipal councils have the right to, among others, “finance the affairs of the municipality by charging fees for services and by imposing surcharges on fees, rates on property and to the extent authorized by national legislation other taxes, levies and duties” (Municipal Systems Act, 2000). However to execute NEMWA, there is an absolute need to develop Integrated Waste Management Plan (IWMP) by all municipalities. Furthermore, this has been re-iterated by the “Inter waste” waste management that “it will make demands of all stake holders from waste generators to those in the local government tasked with overseeing delivery and compliance in waste management strategies” (Inter waste, waste management (nd)). The stake-holders are therefore to be involved in waste management practices irrespective of whether they are from the squatter settlements, rural or the urban areas of the municipality, for an efficient waste management to be effected.

Although it is not clear if the Ekurhuleni Municipality has developed such an IWMP, according to NEMWA, the content of such a plan should be a situation analysis. This shall be made up of a description of the population and development profile of the municipality areas, an assessment of the quantities and types of waste generated in the municipality areas, a description of the available and / or the provided services for efficient waste management. It is also a requirement to provide an analysis of the number of persons within the municipality area who are not receiving such services and identify and address the negative impacts of poor waste management practices on health and environments (chapter 3, section 12). This Act also specifies duties to be carried out by the different stakeholders involved in waste management in the municipalities. These duties include but are not limited to the fact that producers of products need to effectively and efficiently analyze the life cycles of products in order to identify areas where waste generation can be avoided or minimized (clean production). For example, waste generators such as community members should be able to reduce, reuse and recycle their waste so as to minimize the amount of waste that goes to the landfill sites. Seadon (2010) stresses though on the sustainability of this reduction as he recommends that traditional reduction approach to waste management should be more

flexible and enhanced by long term thinking. For example: reporting container recycling quantities while ignoring packaging reduction (Seadon, 2010).

NEMWA recommends that an annual report should be compiled to serve as a general analysis of both the successes, challenges and any necessary amendments to be made to an IWM plan (NEMWA, Chapter 3; section 13). The problems encountered that impinge on the effective and efficient waste management strategies in parts of the Ekurhuleni Municipality as stipulated in the NEMWA document are evaluated in this study. To this effect, a number of proposals and recommendations are suggested on ways to minimize the gaps with an aim of improving the well being of target communities and the environment at large.

2.2.2 The National Domestic Waste Collection Standards, February 2011

The national domestic waste collection standards were drawn in line with the recommendations from NEMWA 2008. In terms of waste collection, the standard is meant to be equitable for all residents within a particular municipality. The collection of waste is to be made by the municipality or service providers who will collect both mainstream and non-mainstream wastes. Residents are encouraged to separate their waste at source and the separation should be according to the municipal or service providers' guidelines.

According to this standard, the frequency of waste collection should be in accordance with the volume and type of waste generated but should not be less than once a week. This frequency also depends on other infrastructures such as a road for the collection vehicles. Areas with such infrastructure problems are encouraged to use a communal collection point which is accessible by the collection vehicles. Setting a workable frequency of waste collection is important as it prevents the dumping of waste which pollutes the environment. Primarily, awareness should be created to all municipal residents such that they are informed about the guidelines that lead to sustainable waste management. The question that could be raised at this instance can possibly be in relation to how the Ekurhuleni Municipality ensures this standard is adhered to.

2.2.3 The Free basic Services and Indigent Support Policy: Revised July 2011

This policy is aimed at ensuring access to basic services for all South African indigents as defined in the South African Constitution. According to the preamble of the SA Constitution (Act 108 of 1996), South Africa belongs to all who live in it and the South African citizens are equally entitled to rights, privileges and benefits of citizenship nevertheless equally subjected to the duties and responsibilities of citizenship (SA constitution, chapter 1, section 3 and subsection 2).

In one of the free basic services and indigent policy's statements, with respect to refuse removal, a discounted rate is subjected to the indigents whose current electricity is limited and restricted to about 20amperes. This policy thus focuses on the less affluent in communities who cannot afford the tariffs set for basic services such as waste removal services. However many municipalities including the Ekurhuleni Municipality are still challenged by this Act due to many factors including overpopulation, understaffing, insufficient funds, lack of monitoring techniques or strategies, lack of necessary infrastructure for waste management and/or general negligence of environmental issues by the biophysical dimension of the environment amongst others.

2.2.4 The Health Act, 61 of 2003

Environmentally, this act stipulates that local authorities are obliged to take lawful and responsible practicable measures to ensure the maintenance of their districts in a hygienic state. They also have to prevent the occurrence of any nuisance, unhygienic and offensive conditions that may be unhealthy to any person within the district. According to the Health Act 61 of 2003, this can be done through environmental health investigations whereby the health officer responsible has reasonable grounds to investigate and believe that any existing condition which constitute pollutants;

- **is likely to cause a health nuisance; or**
- **constitutes a health nuisance, (The Health Act 61 of 2003)**

This, in the case of the Ekurhuleni Municipality, has been highlighted within the municipal by-laws for the management of waste which stipulates that residents within the municipality shall use the bins and bin liners provided by the council to dispose of their waste and by so doing

must avoid hot or ashy waste that might cause the destruction of the containers or that might cause any injury to the council employees who collect the waste. The refuse will be collected by the council as per the municipal refuse collection calendar.

The strategy for sanitation services for informal settlements (2007) validates the Health Act (2003) as the strategy stipulates that waste disposal practices be assessed within the informal settlements for the identification of unsafe practices and measures taken thereof. Keeping this strategy sustainable will ensure the avoidance of the transmission of communicable diseases and environmental pollution. The question that needs to be answered in this situation is “How sustainable is this monitoring strategy in the Ekurhuleni Municipality?”

To emphasize on the strategy for sanitation in informal areas, there is need for the local government to be involved in providing health and hygiene education to the residents, where guidance on the development of the training materials can be obtained from the SA Department of Water Affairs (Strategy for sanitation services in Informal Settlements, 2007). It is not certain if such educational programs exist within some of Ekurhuleni’s informal settlements with view of the amount of waste found in such residents.

2.2.5 The Gauteng Provincial Integrated Waste Management (GPIWM) Policy of 2006

The GPIWM policy was developed in order to set out a vision, principles, and strategic goals and objectives in which the Gauteng Province will implement to be able to achieve integrated and environmentally sustainable waste management within the province (*Status Quo reports on waste minimization plans report*, 2008). The main objective of this policy was to bring a shift from the fragmented and uncoordinated waste management practices to an integrated waste management (IWM) strategy which is more holistic encompassing all the different stakeholders while covering the entire waste cycle during its implementation. According to this policy, the waste cycle include processes such as avoidance, reduction in waste generation, collection, transport, recovery, recycling, re-use, disposal and treatment. But the emphasis lies on the minimization and avoidance of waste which validates the ideas put forward in the Polokwane declaration of 2001 (Polokwane declaration, 2001).

The specific goals for the GIWMP were, amongst others to stabilize waste generation and to reduce the disposal of waste at land fill site, by implementing the IWM system and to develop a set of indicators that will be used to track waste minimization for the state of environment

report in the province. The notion of the reduction of waste disposal that goes to the landfill sites is in confirmation of Hari (1998) and DEAT (2007) to discourage an “end – of – pipe” approach to waste management.

The first step taken to facilitate the adequate implementation of the GIWMP is the development of a general waste minimization plan for the Gauteng province.

Many objectives have been mentioned for the successful implementation of the IWM strategies such as the identification of roles and responsibilities for the national, provincial and local government authorities in the IWM processes.

Waste management at land fill sites can be considered the final phase IWM processes. However, the state of the landfill sites within the Gauteng province shows that most of the sites do not have weighbridges although all the sites in Ekurhuleni have one (*Status Quo Report for Waste Minimization Plan, 2008*). It thus makes the calculation of the amount (volume) of waste disposed off at the sites impossible without weighbridges. According to this report, in terms of recycling, only 3 of the 6 land fill sites in Ekurhuleni carry out some form of recycling on site. The integrated model of waste management therefore encourages “public participation in waste minimization plans, since stakeholders should be represented by all relevant interests and sectors of the society” (*Status Quo Report for Waste Minimization Plan, 2008*). Njenge and Okot-Okuma (2011) report on the state of the Ugandan waste management strategy which is failing because it is not mainstreamed into local development plans and weak resource mobilization, thus better implementation will be achieved when stakeholders “own” the process and integrate it with their daily activities.

This research is also an attempt to find out the extent to which the Ekurhuleni municipality is implementing the IWM system as prescribed from the provincial head quarters. The IWM strategy can be compared to the systems approach illustrated by Godfrey and Oelofse (2008) where the different activities leading to waste generation and management are viewed as a system. If one of the activities in the system fails, the whole system also fails. The differences between the two sets of activities and the challenges can be further analyzed to diagnose the causes of the challenges and thus strategically solved (Oelofse and Godfrey 2008). The ideas of Godfrey and Oelofse (2008) form one of the aims for this study where an analysis of the challenges experienced during the implementation of waste management strategies is made.

2.2.6 The Environmental Management Framework for Ekurhuleni, 2007

The Ekurhuleni Municipality has inhabitants from various backgrounds and due to urbanization; there is an increase in its population growth. This can be reflected upon from the projections of population growth versus waste generation which shows that the population will probably grow from 2605067 in 2006 to 2710843 in 2010 to 2849124 in 2015 and to 2994458 in 2020 (Status Quo Report on Waste minimization Options, 2008). This population increase leads to and will further lead to the shortage of residential homes hence forcing some of the inhabitants to join in the creation of informal settlements. Population growth will also lead to the increase in waste volumes as Liao and Chiu (2011) state in their study that population increase is directly proportional to the volume of waste generated. In the case of Ekurhuleni Municipality, the existence of these informal settlements is creating challenges within the municipality especially when it comes to the distribution of resources like basic water and electricity and the provision of waste management services (Environmental manager for the studied area, 2011). It is a challenge because these settlements are not legalized hence their waste amongst other environmental problems are not usually effectively attended to, probably the reasons why waste is usually piled up in front of these residences and eventually burnt by the squatter settlers after long periods of non collection . The EMF for Ekurhuleni indicated that not every member of the municipality is expected to pay levies, for example the residents whose income is below a certain margin are exempted from paying such levies for basic services offered by the municipality. Although not all the residents in informal settlements fall into such category, it is a challenging activity for the municipality to sort out who is liable to pay the required levies for waste management services since their residences are not registered. This is probably the reason why some basic services are not efficiently rendered. This counters the idea of paying a discounted rate for basic waste management services as stipulated in the free basic services and indigent support policy (2011).

The Ekurhuleni Municipality has a management framework with which they use as a basis for the management of their environment, waste inclusive. Even though there is a management framework in which waste management practices are stipulated, challenges still exist within the waste management sector probably due to these common reasons such as poor financial management in the waste sector, poor equipment management, lack of skilled labour (staff)

management and poor institutional behavior which involve management and planning (Oelofse and Godfrey, 2009). According to the IWM for the Gauteng Province, (2006), all stakeholders need to be involved in the planning and implementation of waste management strategies; the situation of Ekurhuleni Municipality was evaluated in the course of this study.

According to the EMF for Ekurhuleni (2008), the municipality has a central position within the Gauteng province and will continually have a high demand for development although it has very little “spare space” to accommodate further development in the areas that have little to no environmental problems. In the case of Ekurhuleni Municipality, the existence of informal settlements is creating challenges within the municipality especially when it comes to the distribution of resources like basic water and electricity and the provision of waste management services (Environmental manager for the studied area, 2011). It is a challenge because these settlements are not legalized hence their waste amongst other environmental problems are usually not effectively attended to, probably the reason why it is usually piled up in front of these residences and eventually burnt by the squatter settlers after long periods of non collection. The EMF for Ekurhuleni indicate that not every member of the municipality is expected to pay levies, for example the residents whose income is below a certain margin are exempted from paying such levies for basic services offered by the municipality. Although not all the residents in informal settlements fall into such category, it is a challenging activity for the municipality to sort out who is liable to pay the required levies for waste management services since their residences are not registered.

This therefore suggests that there is almost no area within the municipality that does not have environmental problems whereby waste generation and efficient management are some of the major problems that could be realized there, thus a significant challenge to sustainably redevelop existing built up areas in terms of managing the generated wastes (EMF, 2008).

This framework also indicates that the Ekurhuleni Municipality has a comprehensive service that caters for waste management services. The municipality uses six strategically located landfill sites, i.e., the Holfontein, Weltevreden, Reitfontein, Rooikrall, Simmer & Jacks and the privately owned site by Enviroserve in Chlookop. The major challenges faced with respect to the land fill sites as reported in the EMF are that there is only one site which manages

hazardous wastes in Holfontein and most of the other sites have a life span of about 15 to 30 years. There is therefore a major problem anticipated when the sites need to be closed up at the end of their life spans and also to be able to identify new sites in a strategic and environmentally risk free area due to the fact that “spare space” is limited within the municipality (EMF, 2008)

The Department of Water Affairs and Forestry (DWAF, 2005), also lays emphasis as a way of recommendations that, the land fill sites must be monitored and evaluated and the records of this evaluation be kept with the responsible official for reference and the measurement of the performance of the site. DWAF, 2005 further stipulates the criteria to be used as requirements for waste disposal by land fill sites as follows:

- **Land fill classification which includes the size and the kind of waste deposited at the site and the sites potential for a significant leachate generation.**
- **Training of land fill operators to equip them with the necessary skills.**
- **Upgrading the uncontrolled and/ or the burning of dumps to become with the sanitary land fill operations.**
- **Creating an audit system towards obtaining a more professional waste management system.**
- **Designs to suit all the different waste management activities.**
- **Compliance with the permit condition and relevant provisions of the minimum requirement (DWAF, 2005).**

Annan, in the United Nations decade of Education for sustainable development for 2005 – 2014 (UNESCO, 2005) views sustainable waste management as one of the world’s greatest challenges. Challenges in policy designation and challenges in effectively implementing the policies have been cited as other reasons for this (Scott and Gough, 2003).

2.3 PRINCIPAL ACTIVITIES IN SOLID WASTE MANAGEMENT

According to a United Nations Development Program (UNDP) survey of 150 mayors of cities around the world, the second most serious problem after unemployment is the inefficient management of solid waste (Da Zhu *et al*, 2008). The principal activities in solid waste

management range from waste generation, storage, collection, disposal and recovery. Challenges are encountered throughout these activities in solid waste management and these will be elaborated in proceeding sections.

2.3.1 Waste Generation and Handling

Waste is generated within the Ekurhuleni Municipality at various levels including, house hold, businesses, hospitals and other industrial activities from the rural areas, urban areas and informal settlement areas of the municipality.

The type of waste generated in households include plastics, cans, garden waste, leftover food and vegetable peels. Although waste generation and handling challenges occur throughout the world, Thomas-Hope, (1998), stipulated that some of the greatest challenges in relation to waste generation and handling are mostly felt in the developing countries. She further explains that this irony is based on the gap between the population growth pattern and modernization in the developing world on the one hand and on the other hand, the lack of capacity to effectively and efficiently manage the generated solid waste as part of an integrated national system. A typical example of such a waste management problem has been reported by the United States Agency International Development, (USAID, 2009) that in most of the Sub-Saharan countries, waste generation exceeds the collection rate due to urbanization and lack of waste management capacity. While most West African countries have major problems in servicing their waste collection trucks and the lack of modern and efficient technology for waste management which thus impacts on the collection (Babayemi and Dauda, 2009), South Africa experiences its major problems with the separation and treatment of organic waste (USAID, 2009).

Considering the very high volumes of waste generated due to urbanization in developing countries it is imperative to maintain proper management of waste which can lead to reduced volumes of waste and also the redirection of individual minds with respect to waste management at individual levels.

According to Odhiambo and Wekesa (2010), majority of the poor urban population in most developing countries find shelter in the informal settlements. These poor inaccessible informal area residents suffer most from deficiencies in services and infrastructure which worsens ill

health and social marginalization (Da Zhu *et al*, 2008; USAID, 2009). For example residents in informal settlements in Abijan are exposed to high levels of environmental risk factor resulting from the poorly managed or lack of waste management practices in such informal areas (Dongo *et al*, 2010).

Although most South African households do not contribute to waste management (Kamara, 2006), all South Africans have been tasked to contribute to sustainable waste management while contributing to the national efforts to achieve sustainable developments and sound environmental management (NEMWA). The implementation of various waste management plans need to be re-visited while simultaneously educating and empowering the community members on different strategies of reducing house hold waste generation. Different individuals will have different manners in which they conceptualize ideas; therefore the education of groups of individuals on similar concepts will encourage similar conceptualization which will lead to a joint effort in combating waste generation. This education should also be extended to municipal workers with respect to strategies needed to optimize waste collection systems. Municipal workers education has been found to improve the level of the waste management practice in Tehran-Iran (Damghni *et al*, 2008). Minimizing the generation of waste during the life cycle of a product will facilitate the closure of the gap that exists between technological and economic needs with the need to having a healthy environment.

2.3.2 Waste Collection and Disposal

A number of national and international waste management policies are based on the concept of the “waste hierarchy” which describes reducing the generation of waste as the most preferred waste management option through recycling up to disposal as the least preferred option for waste management. For instance the UK waste management policy (2007), just like the South African NEMWA, follows the waste hierarchy concept in its management of waste. It is thus a recommendation that the waste hierarchy concept be followed where substances can only be considered as waste when they cannot be recycled or re-used. Household waste forms a major part of municipal waste generated and according to the South African Domestic Waste Collection Standard (2011); waste should be separated at the source of generation before it is collected. In the Ekurhuleni Municipality; waste for disposal is generally collected

by the local authorities for the municipality. Waste is collected from various sources such as all household waste, street litter, municipal parks and garden waste, council office waste and some commercial and industrial waste. The residual waste (waste that is not intended for recycling or composting) is picked up on a weekly basis within the Ekurhuleni Municipality and the type of collection infrastructure is hugely dependent on the method and place of disposal used by the authority, the physical layout for the collection and the current waste management system in place (CSIR, 2011). In addition, the demographic and cultural factors relating to the population served may be of importance in the decisions of waste collection and disposal methods (CSIR, 2011). This can be reflected upon from the Van Rooyen model of EfSE (2006), where the social dimension of the environment which defines the different cultural groups and their beliefs relates that there is need for a compromise between the different waste collection methods and the cultural orientation of a particular group of inhabitants. According to studies carried out on solid waste management tool kits (CSIR, 2011), waste collection systems must provide for the collection of separated waste as required by NEMWA and the national domestic waste collection standards (2011), and current collection systems are often not conducive to waste separation at source and hence must be revised and adapted accordingly (CSIR, 2011). Collection kits which can be used to collect residual waste (non recyclables) include containers such as black sacks, wheelie bins or regular bins. In the case of Ekurhuleni, residents are provided with bins for the collection of their waste and plastic sacks are also used to line the bins of both the streets and household scenarios.

After waste has been collected, it needs to be disposed of appropriately. Waste disposal should be done at well designated and legally protected land fill sites. The Ekurhuleni Municipality makes use of its six land fill sites for the disposal of its waste. Although these land fill sites are said to be strategically located (EMF for Ekurhuleni, 2008), residents still complain about the odour produced from some land fill sites that are close to their residences, (see figure 3.2 showing the closeness of the Simmer and Jack landfill site to residential areas).

There is thus a need for the adoption of a rational waste collection and disposal system by the Municipality or by contracted private waste management companies. According to NEMWA, there is need for the South African municipalities to provide the requirements for:

- **separation of waste at source**
- **collection of recyclable waste**
- **communal collection points, and**
- **drop off center for the recyclable wastes where by the accessibility and drive through options need to be considered critically, (NEMWA; The national domestic waste collection standard, 2011)**

According to the IWMP for Ekurhuleni, the municipality makes use of service providers for the collection of their waste. This aspect of waste management has been outsourced because according to the Municipality, it will not require the capacity to come from the municipality and that the cost will be shared amongst all the minor waste generators (EIWMP, 2011). It is not clear if there are effective monitoring strategies in place that guide the service providers for waste collection and disposal in the Ekurhuleni Municipality.

Waste collection problems can be due to the lack of accessibility to waste at its source. The lack of collaborative efforts of the community members associated with high levels of vandalism, social alienation, disrespect for property and generally low educational standards are other reasons for waste collection problems (Thomas-Hope, 1998; Simon, 2008). Thomas-Hope (1998), Kamara (2006) also highlight some difficulties in collecting garbage which result from the fact that garbage is dumped illegally such as on unoccupied land, road sides, canals and gullies and individuals may burn their waste at its source in an attempt to reduce the odor that results from decomposing garbage which leads to air pollution. This evidence is also true in the case of Ekurhuleni Municipality as most of the squatter inhabitants resort to burning their waste in front of their residence to get rid of the unpleasant odour and aesthetic view. On this note, Nyenje and Okot-Okumu (2011) recommend that local councils need to be empowered and given resource mobilization and apply participatory planning.

On another note, Da Zhu *et al*, (2008) and the CSIR, (2011) explained that waste collection and disposal problems could also arise due to the presence of informal settlements as most often these services are non-existent in such areas. Such settlement areas are either mostly unauthorized or the strategies and technologies adopted for solid waste management might be inappropriate for operating in such settlements. The roads in such settlements are usually

narrow and unpaved and the fact that transport is expensive in terms of fuel prices and timely car services, many municipalities are unable to meet their legal mandate of collecting municipal household waste at least once a week (CSIR, 2011).

Another challenge experienced on the waste collection and disposal activities, is the financial constraints especially in some formal areas and most informal areas which contribute to the ineffective management of wastes. The effects of financial constraints can be mirrored from a study by Parrot *et al*, (2009), in Cameroon. The financial constraints that bring about short comings within the waste management strategies in Yaounde-Cameroon is partly due to the fact that not everyone is formally contracted to the job they do, hence tax collection system is also not efficient (Parrot *et al*, 2009). It is thus difficult for the Cameroon government to contribute financially towards the strategic management of wastes since most of the municipal funds arise from the tax collected.

Within the Ekurhuleni Municipality, domestic waste disposal is ensured through the provision of staff or agents to facilitate the process. There is a problem when it comes to waste collection and disposal especially if it needs to be sorted for the purpose of recycling. Most individuals are generally not committed to sorting out their waste before disposal (Kamara, 2006) probably due to many factors which could include the lack of knowledge about the importance of sorting out waste prior to disposal, the lack of infrastructure for sorting out the waste and / or the lack of the necessary time/patience needed in sorting out the waste. The EMF for Ekurhuleni (EMF, 2008) addresses the fact that waste receptacles such as bins are provided to households and businesses for the storage of waste while awaiting collection but not all the households have the opportunity to access these receptacles. Since only one bin is supplied to the different households, irrespective of its size, waste is not sorted before disposal making the recycling process close to impossible without some form of intervention through sorting out waste prior to disposal. Even though the Ekurhuleni Municipality makes use of its six land fill sites, pressure is still exerted on the land fill sites which might lead to the end of their life spans earlier than the expected dates because as stipulated in the EMF (2008), the rate of disposal has increased by 6% over the past three years. There is enough evidence therefore that this may lead to problems within the waste disposal sector.

Recommendations that will guide the reduction of waste that is disposed to the land fill sites are proposed in this study.

2.3.3 Waste Treatment

The treatment of waste entails what is being done to either eliminate or reduce its harmful effects towards human and animal health and the environment. Although NEMWA adopts the waste management hierarchy as a national approach to waste management, some municipalities e. g. Ekurhuleni still have an increasing volume of waste that goes to the landfill sites and need to be treated in one way or the other (EMF, 2008). According to the waste hierarchy, minimization and prevention of waste are the most preferred followed by recycling, treatment and lastly disposal.

It is evident from the waste hierarchy that if implemented effectively and efficiently, they will be a shift from the “end – of – pipe” waste management strategy to a more sustainable waste management strategy that begins the management process right from the source of waste generation. This means the waste that finally goes to the landfill sites will be considered “waste”. Reducing the amount of waste that goes to the landfill site as informed through the waste hierarchy, will lead to the reduction of leachates in the landfill area and in turn reducing eutrophication in water bodies (Gentil *et al*, 2011).

According to NEMWA, waste needs to be classified according to its hazardous nature to facilitate its treatment and whether or not it can be recycled as disposal is only considered as a last resort. Although Oelofse and Godfrey (2008) argue that they is a hindrance in the successful implementation of the waste hierarchy in the South African context due to the complicatedness of the classification system of waste, there are still a number of treatment methods that could be sustainable. For example:

- Composting, where a mixture of organic matter is allowed to degrade biologically. During composting micro-organisms convert biodegradable organic matter into a stabilised residue known as compost through an aerobic process. The Simmer and Jack land fill site in Germiston, studied during this research composts biodegradable

waste and makes use of the compost as a cover soil. This encourages the rehabilitation of the site through the growth of vegetation such as grass.

- Incineration where as a waste management method, involves the formal treatment of waste using extremely high temperatures. In some cases e.g. waste oils, waste can be recycled through incineration. But in most cases where there are no proper waste management strategies in place, inhabitants turn to burn their waste to reduce the unpleasant smell and aesthetic view. This is usually not done in the recommended manner which makes use of an incinerator. In such instances, there is usually the problem of air pollution which can, in the long run lead to respiratory tract infections of individuals exposed to such pollution types.
- Anaerobic digestion of waste where there is the decomposition of waste in the absence of oxygen. This can lead to the production of methane gas that can be burnt as fuel in the generation of electricity and / or
- The mechanical-biological treatment of waste which involves the drying of waste leading to the reduction in waste bulk and thus facilitating combustion. This is preferably done with household waste (Dubois *et al*, 2004)

2.4 CONCLUSION

Waste and the efficient management of waste have been identified as global problems mostly due to the increasing growth rate of the population and /or urbanization. It is also a main problem especially in the poor developing communities whose environmental waste is either not being managed or is poorly managed due to many different causes which range from poor infrastructure to insufficient or inefficient staffing within the waste management sectors. It is thus a requirement within the GIWMP that all communities be educated on how to manage their waste and thus planning with the aim of waste management should involve the generators of the waste. This will enable them to take ownership of the problem and thus its solution. The case of waste management in Ekurhuleni Municipality is the main focus of this study.

CHAPTER 3 METHODOLOGY

3.1 INTRODUCTION

This research involved a series of choices and research approaches. Choices or designs about what information and data to gather, choices about how to analyze the data and information gathered and other methodological choices involving the cost, time and resources to be used in the research. Acquiring the most accurate findings during a research is therefore directly linked to the choice of methodology made.

According to Anderson and Arsenault (1999), the choice of research design is largely influenced by the desired end products. These desired end products are the research outcomes as stated as the objectives of the research as they determine what information and data would be useful to achieve the objectives. Ideally, all researches should have the capacity to work within different research traditions, designs and also use a variety of research tools and techniques to ensure the validity and reliability of the results. Both the quantitative and the qualitative designs were used during this study which led to the establishment of new knowledge about the environment just like Mokhtar (2005) enhances the fact that “the purpose of doing a research is to add new knowledge to the existing body of knowledge in an area of interest”.

3.2 RESEARCH DESIGN

A design can be defined as “a preliminary plan or concept for the making or production of anything” (Oxford Concise English Dictionary, 1995). Two types of research designs were used in this study, the quantitative and the qualitative designs. The epistemological assumption that is dealt with in this study is qualitative due to the relationship of the researcher with the environment to be researched since she was part of this environment. Data was collected from the same group or subpopulation within the sample, hence, collecting quantitative, numbered data and qualitative data from a sample of the population (Creswell, 2005).

Primary data was collected for this research which includes the original data collected through the self-administered questionnaire, interviews and through personal observations.

3.2.1 Quantitative approach to data collection

The quantitative approach took into account Will's ideology that quantitative research is all about quantifying relationships between variables (Will, 2008). The quantitative research design is thus used in cases where the researcher makes use of large numbers to conclude on the findings. According to Atieno (2009), quantitative research is empirical in nature and makes use of deductive reasoning through the use of measurable tools to collect relevant data. Creswell, (2005) reports that, survey designs are "procedures in quantitative research in which investigators administer a survey to a sample or to the entire population of people in order to describe the attitudes, opinions, behavior or characteristics of the population". Mokhtar, (2005) also explains that generalizations processed from sample to population is the intention of a quantitative researcher and in a research, only a single sample of the subjects is studied and generalization is made back to the population where that sample was chosen. But as people would probably be interested in the population and not the sample, to generalize from the sample to the population, a representative sample should be chosen as recommended by Will (2008). The safest way to ensure that the sample is representative is to use a random selection procedure. The subjects who responded to the questionnaire in this study were randomly selected in a walk about mode from the purposefully selected studied areas in Ekurhuleni Municipality.

A set of questionnaires were designed for data collection for this research. The reliability and validity of the results were ensured by carrying out a pilot study where the questionnaire was administered to twenty members of the Ekurhuleni municipality. The pilot study was aimed at identifying any gray areas within the questionnaire, which could possibly lead to unauthentic results; the necessary amendments were made before the full survey was carried out.

The final set of questionnaire, (annexure D), was administered to 362 randomly selected participants from the selected areas from the southern region of Ekurhuleni Municipality. The demarcated area in the map in Figure 3.1 shows the areas from where data was collected. Some of the areas are not on the map probably because they are informal and unregistered settlements.

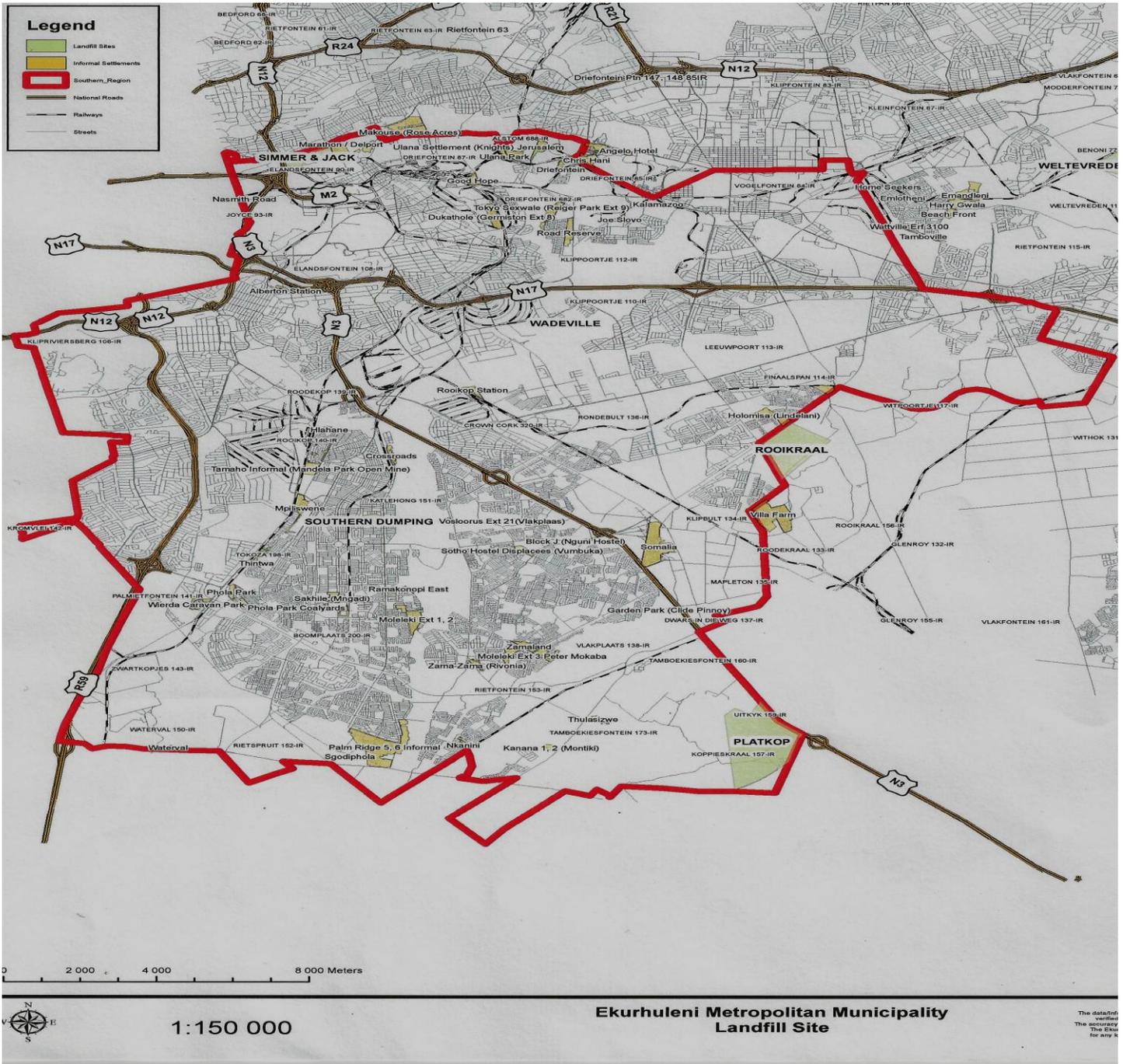


Figure 3.1: A map showing the Southern region of Ekurhuleni Municipality (GIS EMM, May 2012)

The questionnaires were made up of both open ended and closed questions. The closed ended questions dealt with issues such as methods of waste collection/ disposal, payment of levies for waste collection, frequency of waste collection, availability of dump sites close to

residences, training on waste management strategies, and waste management interactions with the municipality. The open ended questions provided the opportunity for clarity to the closed questions. The questionnaires were designed in English and explanations were provided to respondents who had difficulty understanding some of the questions. Due to the fact that amongst the different South African languages spoken within the Ekurhuleni Municipality, IsiZulu makes up one of the most widely spoken local languages, some of the questions within the questionnaire had to be interpreted into IsiZulu for the benefit of some of the respondents.

The specific paradigm that was followed in the course of this study was positivism. This is quantitative in approach as emphasis is laid on the measurement of behaviors and prediction of future measurements through the analysis of data from the questionnaires. According to Anderson and Arsenault (1999), in the positivist paradigm, things are only meaningful if there are observable and verifiable. Due to the criticism of positivism as a paradigm, as observation is not value free and also the fact that human behavior such as intentions and feelings cannot be directly observed (Loubsher, 2005) the post positivist paradigm was used to ensure the quality of the data.

3.2.2 Qualitative approach to data collection

Qualitative approach to the collection of data was used in cases where the findings could be obtained from small but quality numbers of subjects from within the population or from observable cases (Will, 2008). According to Terre Blanche *et al*, (2006), a qualitative researcher makes sense of feelings, experiences, social situations or phenomena in real world situations. A qualitative study was done so as to compliment the data collected quantitatively thus laying emphasis on the post positivist paradigm and to provide an empirical enquiry that investigates a contemporary phenomenon within its real life content and without any intervention (Berry, 2006). This was done through a case study. Yin (2009), reports that in a case study design, the researcher has no control over the case to be studied but proceeds with the investigation through interrogating on the how and why questions. This reasoning was supported by Will (2008) who adds that case studies are descriptively analyzed and in a descriptive study, no attempt is made to change situations as things are measured as they are

since they are observational. An in-depth exploration of a bounded system based on extensive data collection (Creswell, 2005) was also a focus in this case study where the Simmer & Jacks landfill site was explored as the bounded system.

The Simmer & Jack land fill site is situated along the Main Reef and Jodann-Rissik road in Germiston with gps coordinates S26115611° E28091899°. The landfill site is bounded by the 'Marathon' informal settlement, Elandsfontein, Germiston and the Simmerfield residential area as shown in **Figure 3.2**.

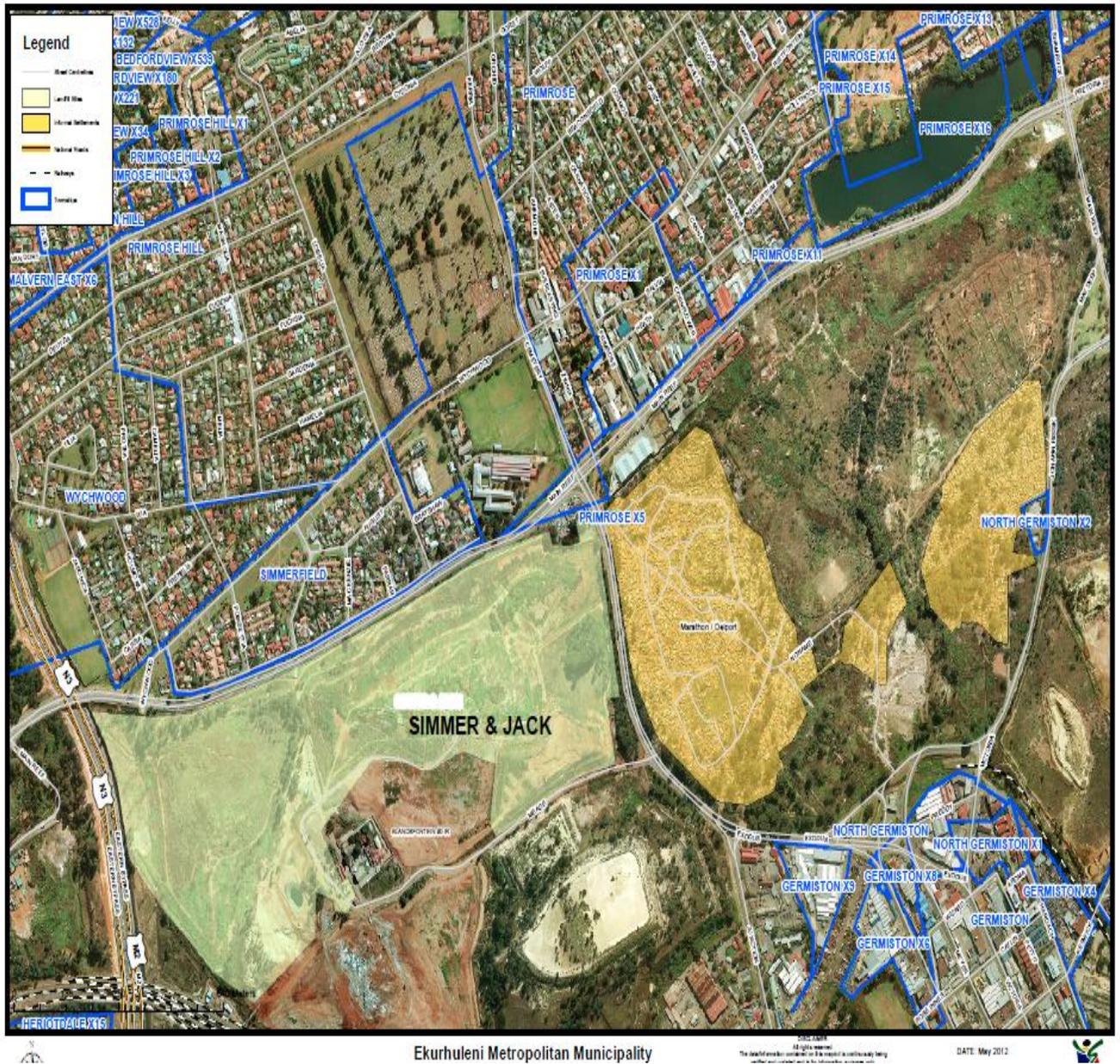


Figure 3.2: A Map showing the location of the Simmer and Jack landfill site and surrounding residential areas (GIS EMM May 2012)

The Simmer and Jack land fill site was previously a mine and thus the hole left behind after the mining activities is now being filled up with the waste.

A case study of this site was aimed at the following:

- Studying the type of waste that is disposed at the site.

- Studying the different waste treatment methods that take place at the site.
- Studying the type of training and experience which the workers at the site have obtained to be able to manage waste at the site.
- Acquiring knowledge about the problems encountered at the site during the management of waste.
- Having an idea of the life span of the land fill site and what plan is in place in locating another land fill site at the end of the current one's life span.
- Obtaining information on the different kinds of people who dispose their waste on the site.
- Learning about the different types of equipment used in managing waste on the site.
- Finding out the compliance to health and safety issues for land fill workers when on duty on the site.
- To find out if there is any form of recycling taking place on the site.
- To acquire knowledge of the tariff charged for the different type of waste that is disposed on the site, and
- Finding out about the site's policy which guides both the workers' activities and the activities of the users of the site?

Different interview sessions were carried out with different categories of workers on the Simmer & Jack landfill site. The workers interviewed were from the waste treatment (management) section and from the weighbridge section.

The participants for the interview at the landfill site were purposely selected in order to collect rich data that provided an insight of their lived experience in waste management at the land fill site. During the interview sessions, a field note book and a tape recorder were used to keep a record of the responses given by the interviewees. The use of a variety of instruments is recommended for data validation (Stake, 1995, Henning, Gravett & Rendsburg, 2005). The questions in the interview protocol were made up of both structured and semi- structured type

questions (Merriam, 2002) - see Annexure E. The structured questions were according to the above aims of the case study while the semi-structured questions were unplanned but on further probing, came up due to the type of responses that were given by the respondents. The semi-structured questions provided an opportunity for clarity of certain responses thus providing an in depth understanding of the situation.

A structured questionnaire was responded to by a waste manager from the Germiston area followed by an oral interview to further validate the responses given in the questionnaire. This was used to validate the data that was collected from the community members and also the interview sessions conducted with the land fill site workers.

3.2.3 The Study Area

Participants for this study were drawn from selected areas within the southern region of the Ekurhuleni Municipality which includes the following areas: Germiston (including the Simmer and Jack landfill site), Alberton (including Thokoza and Kathlehong) and Boksburg. Although waste management problems are experienced in almost all parts of the Ekurhuleni Municipality and the Gauteng Province in general, the selected study areas were made due to proximity of the researcher taking into consideration the fact that the study was not funded by any external source.

In sections of the results, the study area is differentiated into informal (the squatter settlement areas) and formal (consisting of the high density and medium density) areas with respect to the level of affluence. The more affluent low density areas were not covered during this study. It was realized that the waste management situation in such areas is similar to that of the medium densities although they pay more tariffs. It was also realized that they cover a smaller population within the study area.

For the purpose of this study, the informal areas were made up of the following informal squatter settlement: the Marathon squatter settlement areas in Germiston, and the Thina Zonke and Zonke Zizwe squatter settlements in Thokoza and Kathlehong. The medium density formal areas included Germiston, Boksburg and Alberton while the high density formal areas were the suburbs Thokoza and Kathlehong.

3.2.4 The Sample

According to Will (2008), accuracy in the estimation of the relationship between variables can be achieved through a descriptive study usually when a sample of hundreds or even thousands of subjects is involved in providing the required data. The estimate of the relationship is less likely to be biased if you have a high participation rate in a sample selected randomly from a population.

The 2001 census of South Africa provides population statistics which show that in the Ekurhuleni Municipality, individuals above the age of 18 make up about 70.55 % of the entire population which is about 1.74 million people. This study was conducted from specific areas within the municipality making up a small portion of the municipality and 369 individuals from the studied areas participated in the study although a target sample of 500 was set at in the design of the study.

A set of questionnaires were distributed randomly which were responded to by 362 respondents from the community. The sample size was considered enough to detect the smallest worthwhile effect or relationship between the different variables in this study.

Seven individuals were purposefully selected to participate in the different category of interviews undertaken. The selection criterion was based on individuals who are directly linked to the waste management process within the studied areas. Amongst the seven interviewees, four were landfill site workers at the Simmer and Jacks landfill site who participated in a focus group interview. One was a supervisor at the Simmer and Jack landfill site, one was a weighbridge worker at the land fill site, who both participated in separate one-on-one interview sessions and finally one was a waste manager for the studied areas in Ekurhuleni who responded to a set of questionnaires and again participated in a one-on-one interview. This gives a total of 369 participants in the study which makes it 73.8% of the targeted sample of 500. All the participants were above the South African legal age (18 years) who happen to have spent most of their time within the municipality; e.g. residents and workers within the Ekurhuleni Municipality.

3.2.5 Data analysis

The findings of the study were analyzed in order to achieve reliable results that inform of the challenges and their causes, within the waste management sector in the Ekurhuleni Municipality.

The quantitative data collected from the survey was analyzed using different methods. The open ended questions were descriptively analyzed. Some of the close ended questions were analyzed on excel. These questions were based on the respondents' role in waste management. The other set of questions from the questionnaire which were based on waste management service provision by the municipality were statistically analyzed using the Statistical Program for Social Scientists (SPSS) software after allocating codes to the various variables. The results analyzed using SPSS were tested using two tests: the chi-squared test and the Fischer exact test. This ensured the reliability and the validity of the results. The analysis of the results from SPSS and excel was made through the use of tables, graphs and detailed descriptions. The results portray, on the one hand the differences, and causes of the differences, that exist between the policy and implementation of waste management and on the other hand looking at the differences and their possible causes in the level of provision of waste management services between the formal and the informal studied areas within the municipality. The qualitative data collected through interviews were separately transcribed (Annexure E) although a combined descriptive analysis of their contents were made while the data collected from the observed case study was also descriptively analyzed.

The results from the waste manager in Germiston were descriptively analyzed, which on one hand validated the results obtained from the community members and on the other hand validated the results obtained from the landfill site workers.

The types of variable relationships that exist in this study are a cause-and-effect type of relationship. This can be seen primarily through the fact that if waste managers (the social dimension of the environment) and community members (the biophysical / social dimension of the environment), do not effectively and efficiently manage waste according to NEMWA and other municipality's frame work and by-laws (the political dimension of the environment), then there are going to be challenges within the waste management departments. Secondly, if

there is a difference (gap) realized between the waste management strategies within the informal and formal parts of the studied areas, then it will probably lead to detrimental effects on the environment whose waste has not been 'properly' managed. Lastly, if the analysis of the cause of a waste management problem is not efficiently done, then the solution to that problem will also not be appropriate.

3.3 The Research Ethics

This research study was carried out after receiving consent ethical clearance from the Ekurhuleni Municipality (Annexure B) and from UNISA (Annexure A) respectively. Prior consent was sought from all respondents (Annexure C). At the end of this research, the necessary findings and recommendations will be shared with the Head of the Waste Management Department in Boksburg – Ekurhuleni.

Other ethical considerations made during this study included the following:

- The respondents of both the questionnaire and the interview were not required to reveal their identity.
- According to the consent form, the participants could withdraw from the study at any time if they did not feel comfortable carrying on.
- Some of the questions had to be verbally translated into isiZulu for the convenience of those who were conversant in isiZulu and whose first language is not English.
- The use of other people's work was acknowledged.

3.4 Study Limitations

It will not be fair to say that a research of this magnitude and significance, made up of in depth findings that involved a wide range of people and a sensitive area would be free of shortfalls. The challenges encountered during this study were from various dimensions as evident below:

- a) It was very difficult to get the maximum amount of time and high numbers of respondents needed to collect the required data for this study.
- b) Collecting data from the community members was challenging in the sense that some individuals willingly collected the questionnaire with the intention of cooperating in the

study, but ended up giving neither the partly answered nor the unanswered questions back to the researcher. In this regard, from the questionnaires that were handed out to the potential respondents, only 362 out of the 500 partook in responding to the questionnaires although 500 was the target.

CHAPTER 4 RESULTS

4.1 INTRODUCTION

This chapter gives the outcome of the study which is an overall view with respect to the participants of this study, on the waste management scenario in the studied parts of the Ekurhuleni Municipality.

The results have been arranged in the following manner which is in line with the objectives for this study:

- The respondents' knowledge about waste management and the problems they face with respect to waste management.
- The waste management practices in designated areas of Ekurhuleni municipality and the problems associated with the effective implementation of those practices. This was done to inform of the gaps between the NEMWA, Act 59 of 2008 and the local implementation of waste management strategies. It is anticipated that this would also bring out the differences that exist in service delivery by the municipality in the different geographical areas.
- The causes of the gap(s), if any, have been presented for the formal medium density, formal high density and informal squatter areas.

The evaluation of the gaps was used to guide the recommendations of the possible plans of action that could be used to address any existing gaps.

4.2 RESULTS AND ANALYSIS OF THE RESPONSES FROM THE QUESTIONNAIRES

Waste management is a very important activity within societies irrespective of the many challenges associated with efficient waste management practices. This statement was found true based on the questionnaire and interview responses that were given by the members of the Ekurhuleni Municipality during this research. All the 369 respondents in this study indicated that waste management is a very important process.

A total of 362 Ekurhuleni community members responded to the questionnaire and 7 members participated in the different interview sessions. Therefore a total of 369 participants in the

study gave a response rate of approximately 74% of the targeted 500 participants. From the total number of participants who responded to the questionnaires, 84% were resident within the municipality. This is important as the results generated were from lived experiences. Five percent were business owners who only come to run their business within the municipality while 8% were employees who come into the municipality daily for the purpose of work. Amongst the respondents, 3% did not declare their purpose of being within the municipality and statistically this number did not negatively affect the validity of the generated results.

Out of the 362 adults who responded to the questionnaires within the study areas of the Ekurhuleni Municipality, 161 (44%) were males, 200 (55%) were females and 1(0.4%) respondent did not declare the gender and area of residence. Thus the results from the questionnaire were based on 361 respondents. Amongst the respondents, 89 respondents represented the high density formal areas, which were made up of 58% males and 52% female. The medium density formal areas were represented by 176 respondents with 40% males and 60% females. The informal squatter areas were represented by 96 respondents where both the males and the females were coincidentally equally represented at 50% each.

4.2.1 The respondents' knowledge of the importance of having a clean environment

The Ekurhuleni community members generally have good knowledge with respect to the importance of having a clean environment. The following were some of the reasons given by the respondents from the informal residential areas in response to why a clean environment is important:

- To have a healthy environment
- To avoid diseases
- To prevent scavenging or children from picking up dangerous objects like glass
- To avoid stagnant water that can be a breeding site for most pathogens
- To avoid stinky air
- To have good aesthetic effects
- To attract passers-by
- To improve the image of the area and
- To avoid pests like rats.

The respondents from the formal areas also gave the following responses as to why a clean environment is of importance:

- To be proud of the environment where they come from
- To have good health
- To prevent land pollution
- To have clean streets
- To have an improved economy
- The waste collected can be recycled
- To prevent the depletion of the ozone layer
- For sustainability
- For the safety of children
- To prevent air-borne diseases
- For the fact that cleanliness is next to godliness and
- To improve the value of the properties in the area.

4.2.2 Waste management problems encountered by the community members

An analysis of the results obtained in this study, showed that there are many challenges in having an effective waste management practice within the Ekurhuleni Municipality. The respondents from the informal, formal high and medium density areas pointed out some waste management problems they encounter within the municipality. The following waste management problems were cited by the respondents from the informal area:

- The waste generated at homes is not collected every week
- Collection days/dates are changed without prior notice / irregular collection days
- None collection of waste on rainy days
- Insufficient frequency of waste collection per week and
- The sizes of waste disposal containers provided are too small.

Respondents from the formal high and medium density areas brought up the following points:

- Late pick up times

- The frequency of collection is very low
- Littering during collection
- Collection days are skipped during some weeks
- Difficult to recycle as they are no recycling facilities
- There are no separate bins for sorting out waste
- Workers are unidentifiable as they don't come in uniform at times thus they pose a security threat.

4.2.3 Waste management problems due to land fill and illegal dump sites situated close to residential areas

The Ekurhuleni Municipality has six official land fill sites and numerous unofficial and / or illegal dump sites where some are located within the proximity of the residential areas. In situations where there is proper waste management, it is most desirable that there be no illegally made dump sites or legal sanitary landfill within the proximity of human dwellings. From this study it was observed that some members of the community reside close to land fill or self made dump sites. For example the Marathon squatter settlement area is located at about 50metres from the Simmer and Jack landfill site, and this landfill site is separated from the Simmerfield residential areas only by a road size (the Main Reef road). Residents from the informal dwellings also have illegal dumpsites directly in front of their residences as observed during this study. The responses indicating closeness of residential areas to landfill sites or dump sites are presented in **Table 4.1**.

Table 4.1: Existence of dumpsites close to residential areas

Existence of dumpsites close to residential area	Type of residence					
	Informal Squatter		Formal High Density		Formal Medium Density	
	Number of respondents	Percentage of respondents	Number of respondents	Percentage of respondents	Number of respondents	Percentage of respondents
Yes	38	40	30	33.7	66	37.5
No	57	59	56	62.9	105	59.6
Missing system	1	1	3	3	5	2.9
Total	96	100	89	100	176	100

Table 4.1 shows that 40% of the respondents from the informal areas, 37.5% from the high density formal areas and 33.7% from the medium density areas have a land fill or an unofficial dump site around their residences or business sites. This finding negates the 59.6% from the medium density areas, 62.9% and 59% from the high density and informal areas respectively, who do not have any dumpsites close to their residential areas. A minority group consisting of 5 from the medium density areas, 3 and 1 participant from the high density and informal squatter areas respectively did not respond (missing system) to this question. Landfill sites or illegal dump sites have been found to exist close to some residences in all the different studied areas.

4.2.4 Waste collection and disposal methods used by the Municipality and Residents

Various waste disposal and collection methods are used by the community members in the study areas. According to the waste manager for Ekurhuleni, (2011) the waste collection activity is outsourced to waste collection companies. The results on the methods used in waste collection and disposal are shown in **Table 4.2**.

Table 4.2: Waste collection and disposal methods in the studied area.

Collection/ disposal methods	Respondents using the different methods in the studied areas					
	Informal residential areas		Formal high density areas		Formal medium density areas	
	Number of respondents	Percentage of respondents	Number of respondents	Percentage of respondents	Number of respondents	Percentage of respondents
Large trucks	6	6.3	82	92.1	164	93
Dump sites	28	29.1	4	4.4	6	3
Burning	56	58.3	1	1.1	2	1
Others	6	6.3	0	0	1	0.56
Missing data	0	0	2	2.2	3	2
Total	96	100	89	100	176	100

Within the informal areas only 6.3% of the respondents dispose off their waste through pickups by the municipality large trucks while 29.1%, and 58.3% of the respondents respectively either disposes their waste directly at the closest dumpsite or they burn their waste. This shows that a lot of people in the informal areas do not have access to the municipal waste collection services. In the medium density formal residential areas, 93% of the respondents make use of the municipality large trucks in disposing off their waste while only 3% go directly to the dump sites and another 1% burns their wastes. From the high density formal areas, 92.1% benefit from the waste collection services rendered by the municipality while 4.4% and 1.1% respectively dispose off their waste at a close by dumpsite or burn their waste. None of the participants used a combination of methods in disposing off their waste. From these results, it is clear that while most of the residents in both the formal high density and medium density areas use the municipal trucks for their waste collection and disposal, the residents in the informal areas use burning and self dumping as the main disposal methods. There is a big difference in the percentage of people getting the municipal services in the formal and informal areas. Almost all (93% and 92% respectively) of the residents in the formal areas use the municipal trucks as compared to 6.2% in the informal squatter areas. Twenty nine percent of the people in the informal area dump their waste at the nearest dumpsites while the majority (58.3%) burns their waste around their residences.

The Chi square test of homogeneity was used to test for significant differences between the proportions of the different geographical areas that were studied with respect to waste management. A significant test statistic would indicate that the groups differ on the distribution of the variable of interest but does not indicate which of the groups are different or where the groups differ. The null and alternative hypotheses are as follows:

Null Hypothesis: The Ekurhuleni Municipality provides equal levels of waste management services to all the studied areas.

Alternative Hypothesis: The Ekurhuleni Municipality does not provide an equal level of waste management services to all the studied areas.

The Fisher exact test was used in instances where the frequency of the variable was less than 5 while the standardized residual method was used to compare which “discrepancies between the observed and the expected values are larger than might be expected by chance” (Beasley, 1995). A conclusion was therefore drawn which informed of the acceptance or the rejection of the null hypothesis.

Waste collection in the study areas was represented as follows:

$$\chi^2 (8, N = 287) = 115.960, p < .01$$

This indicates a significant difference between the proportions of the different studied areas. The Fisher exact test value is 115.960 and the p-value is 0.001 which indicates a difference between the predicted and the observed frequency of waste collection by the municipality within the different studied areas. **Table 4.3** shows the standard residual values for the different studied areas.

Table 4.3: Standard residual values for waste collection frequency in the studied areas

Study Areas	Collection frequency / Standard residual values				
	Once a week	Twice a week	Once a month	Twice a month	others
Informal squatter	-3.9	-1.0	2.3	1.9	11.2
Formal density high	1.0	-1.2	0.7	1.2	-2.7
Formal density medium	1.0	1.3	-1.5	-1.7	-2.9

These standard residual values are compared to a critical value that corresponds to an alpha of 0.05 (+/- 1.96).

The standardized residuals reveal that the collection frequency of “once a week” is significantly under-represented in the case of the informal squatter areas whilst the “once a month” and “others” are significantly over-represented. This means that waste is not usually collected once a week in the informal squatter settlements.

For both the Formal medium and formal high density areas, the “once a week” frequency is highly over represented while the “once a month” and “other” frequencies are highly under-represented. This means both the formal high and medium density areas, on the one hand are equally represented with no significant difference for the once a week frequency. But on the other hand, they show significantly high differences in terms of the other waste collection frequencies.

The statistical analysis can be represented in terms of the actual percentage of respondents who experienced the different frequencies during their waste collection by the municipal trucks. **Table 4.4** shows these results.

Table 4.4 Frequency of waste collection by municipality’s trucks in the studied areas.

Waste collection frequency	Informal Squatter Areas		Formal High Density Areas		Formal Medium Density Areas	
	Number of respondents	Percentage of respondents	Number of respondents	Percentage of respondents	Number of respondents	Percentage of respondents
Once a week	3	3.1	78	87.6	146	82.9
Twice a week	0	0	4	4.4	19	10.7
Once a month	3	3.1	2	2.2	0	0
Twice a month	0	0	3	3.3	0	0
Others	21	21.8	0	0	3	1.7
Missing System	69	71.8	2	2.2	8	4.5
Total	96	100	89	100	176	100

The ideal frequency for waste collection that has been set out by the municipality is once a week for all its areas (Ekurhuleni Waste Manager, Interview July 2011). The majority of the respondents from the formal residential areas indicated that their waste is being collected once every week by the municipality’s large trucks. This frequency is backed up by the fact that 87.6% and 82.9% of the respondents from the high density formal and medium density formal areas respectively have their waste collected once every week. However only 3.1% of the informal residents have their waste collected once a week. Another 3.1% of the informal residents have their waste collected once a month. From the medium density formal areas none of the respondents have their waste collected once a month and only 2.2% from the high density formal areas have such an experience. Nevertheless, 10.7% and 4.4% respondents from the medium density and high density formal areas respectively have the opportunity for their waste to be collected twice a week as opposed to none in the informal settlement areas. It is evident that the informal area residents barely benefit from the municipal waste collection services because their waste is collected less frequently and only a very small number of the residents enjoy the benefits. For example, while 82.9% and 87.6% from the medium and high density residential areas have their waste collected according to the standards, only 3.1% of the informal residential area respondents have such an opportunity. A large number of participants, 71.8% from the informal settlements did not respond to this question. This can

probably be due to the fact that they may not be aware of the services or they make use of drop off sites where they may not be aware of what is happening there after. Only 2.2% and 4.5% from the high density formal and medium density formal areas did not respond to this question respectively.

4.2.5 Sorting out of waste for recycling prior to disposal

The disposal of waste is considered as the last option according to the waste management hierarchy and NEMWA endorses this. Waste therefore needs to be recovered in some way. Sorting out of waste is part of any effective waste management strategy. NEMWA stipulates that strategies for waste management must include the objectives, plans, guidelines, systems and procedures in order to achieve the objects of the act. Sorting out waste prior to disposal is therefore one of the procedures that can lead to the minimization of waste since it makes it easier for waste to be recovered, recycled or reused. During this study, the sorting out of waste by the respondents was investigated. The results obtained are presented in **Table 4.5**.

Table 4.5 Response to waste sorting by the respondents prior to disposal

Type of responses	Responses from the informal area		Responses from the formal area			
	Number of respondents	Percentage of respondents	High density areas		Medium density areas	
Number of respondents			Percentage of respondents	Number of respondents	Percentage of respondents	
Yes	73	76	33	37	30	17
No	6	6	25	28	96	54
Sometimes	2	2	28	32	48	27
Missing Data	15	16	3	3	3	2
Total	96	100	89	100	176	100

From Table 4.5, there are indications that some residents sort out their waste before disposal while others do not. The results show that 76% of the respondents in the informal areas sort out their waste regularly into the different classes before disposal and only 2% sometimes sort out their waste before disposal. A total of 6% do not sort out their waste. In the formal areas

only 37% and 17% from the high density and medium density areas respectively sort out their waste regularly before disposal, another 32% and 27% from the high and medium density areas respectively sometimes sort out their wastes while 6% from the informal areas, 28% from the high density formal areas and 54% from the medium density formal areas do not sort out their waste. It is worth noting that more residents in the informal areas sort out their waste prior to disposal compared to those of the formal area although a few participants did not respond to this question. This includes 16% from the informal areas, 3% and 2% from the high density formal areas and medium density formal areas respectively.

4.2.6 Environmental Education

Environmental education is a necessity for an effective waste management process as both the 'waste managers' and the residents will obtain the required knowledge and skills in order to implement 'best practices' in waste management. According to NEMWA, guidelines should be made by the Minister in charge, on raising awareness regarding the impact of waste on health and the environment. These guidelines are to be implemented by the different municipalities. Education about the environment is emphasized in the Van Rooyen model of Education for Sustainable Environment (Van Rooyen, 2006). This model suggests that knowledge about the cause of an environmental problem will ultimately lead to its effective management. It is thus imperative that every community member has at least some basic knowledge about the environment including waste management and its associated present and potential problems. This aspect of environmental education is clearly spelt out in the Ekurhuleni Environmental Policy (2006). The community members who participated in this research also acknowledged that it is important to have some training so as to achieve the necessary knowledge and skills required for waste management.

The following results were obtained with respect to Environmental Education offered by the Ekurhuleni municipality to its inhabitants:

$$X^2 (2, N = 343) = 163, p = .072$$

The Fischer's exact value of 5.163 and the p-value of 0.072 was obtained which indicate there is a difference in the level of training between the expected and the observed levels. **Table 4.6** represents the standard residual values.

Table 4.6: Standard Residual values with respect to Environmental education/training services offered to the respondents

Study Areas	Standard residual values / Responses	
	Training Received	No Training Received
Informal Squatter	-1.6	0.4
Formal High Density	1.4	-3.0
Formal Medium Density	0.1	0.0

Comparing the standard residual values to the critical value of 0.05 (+/- 1.96), there are observed differences between the levels of training and no training for the different studied areas.

The most significant difference was observed amongst the informal respondents with a value +/- 2. Therefore a null hypothesis is rejected in favor of the alternative hypothesis that Environmental training is not being implemented at equal levels within the different geographical areas of the municipality.

These results are further represented in terms of the actual percentage as shown in **Figure 4.1**.

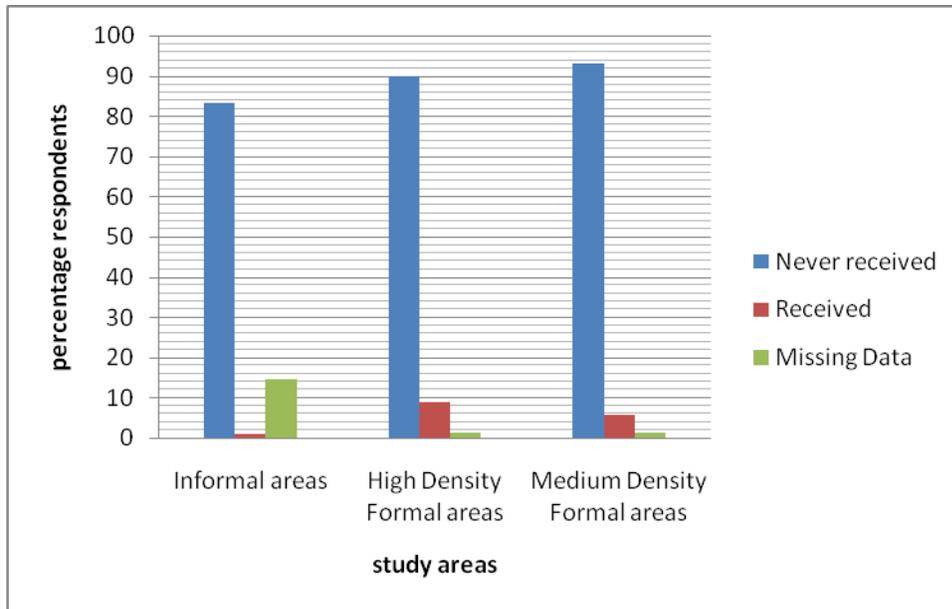


Figure 4.1: Level of waste management training within selected areas of the Ekurhuleni Municipality

The results with respect to training on waste management shows that a majority of the respondents have not received any training as only 1.04% of the respondents from the informal areas, 8.9% and 5.6% from the high density formal and medium density formal settlements respectively indicated to have received some training. A few respondents did not respond to this question (missing system) which constitutes 15.6% from the informal areas, 1.25% and 1.3% from the formal high density and formal medium density areas respectively.

Even though only a minority of the respondents indicated to have received training on waste management practices, a variety of methods are used by the municipality to educate the public on how to manage their waste. Notwithstanding, from the results in Table 4.5 it is evident that there is lack of awareness, participation and public knowledge with respect to waste management within the studied areas of the municipality. According to the interview with the Waste Manager for Ekurhuleni Municipality (2011), the public perception of waste management is disposal oriented as opposed to recycling, reclaiming and reusing. This supports the above results with respect to the fact that there is little waste management training being implemented by the municipality to foster the change in public perceptions and values towards sustainable waste management practices.

Table 4.7: Methods through which the respondents have received education about the environment

Environmental education methods used	Number of respondents	Percentage of respondents
Circulars	10	2.7
Residential contracts	6	1.6
Flyers	7	1.9
Unspecified methods	3	0.8
Missing system	336	93
Total	361	100

Most of the respondents (93%) did not respond to this question (missing system) most probably because they have never been given the opportunity to attend any waste management training or they have not had interest or any compelling reason in attending waste management training sessions offered. Generally from all the participants who took part in responding to the questionnaire, only 7% of the respondents responded to have had some form of waste management training as is shown in the summary of the results from respondents from both the formal and the informal residents. It can be seen from the results in Figure 4.1 that 83.3% of the respondents from the informal areas, 89.8% and 93.1% from the high density and medium density formal areas respectively indicated that they have never had any training. Nevertheless, about 2.8% of the respondents who acknowledged that they have received some training on waste management received such through circulars, 1.6% received it through their residential contracts and 1.9% received it through commercial flyers while 0.8% received it through other unspecified methods.

4.2.7 Waste management tariffs in Ekurhuleni Municipality

According to NEMWA, municipalities are to set up fees for waste management services within their respective municipal areas. This is true for the Ekurhuleni Municipality as levies are being paid by the community members which cover the services of waste management. It was discovered that not all the members of the community pay for these services. Figure 4.2 shows the number of community members who pay for waste management services.

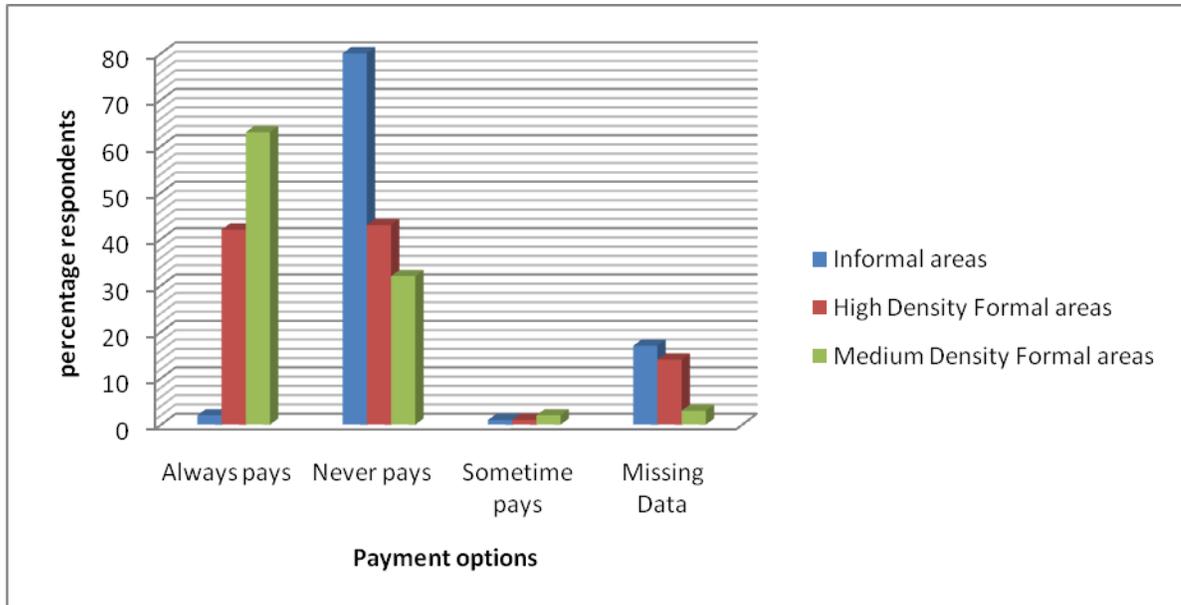


Figure 4.2 Responses with respect to the payment of fees for waste management services in the studied areas.

According to the results obtained from a Waste Manager for Ekurhuleni Municipality, there is an uneven allocation of levies for waste management to all the municipal members whereby residents in the informal squatter settlements do not pay while the residents from the high density suburb pay less compared to the more affluent urban area inhabitants. From the analysis of the results obtained during this study, a very low percentage of the respondents, 2%, resident in the informal areas pay fees for their waste to be collected, and a higher percentage, 80%, do not pay any fees for this service and 1% sometimes pay the levies as presented in Figure 4.2. With knowledge of the fact that the informal residents are not charged any fee for waste management services, the few respondents who responded to be paying such fees may not have properly understood that question or may not have been truthful for fear that the researcher may want to expose them.

In the formal high density areas, 42%, of the respondents pay for their waste management services, 43% do not pay such fees and another 1% only pays the fees sometimes (Figure 4.2). On another note the formal medium density areas indicated the following results with respect to the payments of waste management tariffs: 63% always pay their fees, 32% never pay the fees and 1.69% sometimes pays the fees. The response from the medium density

area on non payment of fees could be probably due to the fact that most of the respondents to the questionnaires are not the residence owners but are renting and as such might not be responsible for the payments of such waste management tariffs. Some respondents did not indicate their status on tariff payment for waste management services rendered by the municipality (missing system). These made up 17% for the informal areas, 14% and 3% for the formal high density and formal medium density areas respectively.

The Ekurhuleni community members have laid complains as to the challenges they face with the management of their waste by the municipal council, as indicated in the Germiston city newspapers of 26th March 2009. According to this study a great majority of them are prepared to pay even more if it is guaranteed that they will be provided with better waste management services. The level of willingness to pay more is represented in **Figure 4.3**.

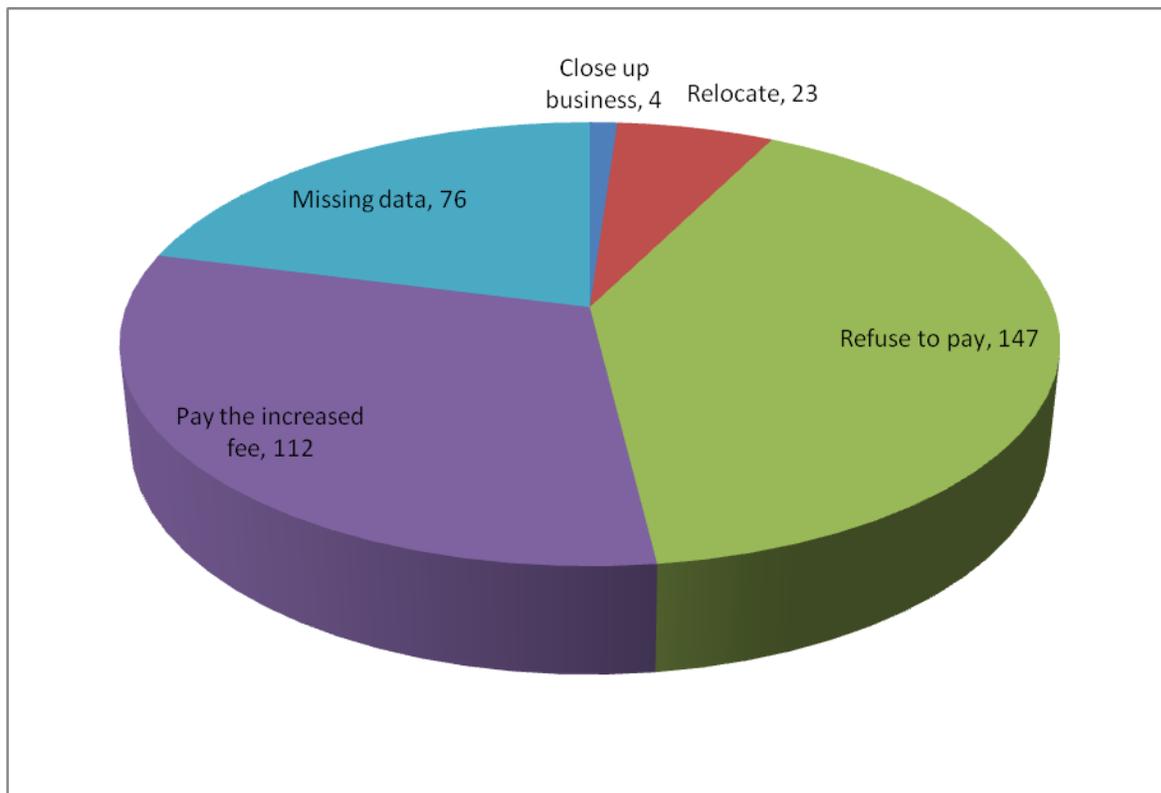


Figure 4.3: Participants' views about payment of an increased tariff for better waste management services.

From the results in Figure 4.3, seventy six (76) individuals (21%) who received the questionnaires did not respond to the question on views on paying fees for waste

management. The response distribution per residential type are given in Figures 4.4, While a great majority (41%) of the respondents chose to refuse making any increased payments on the waste management levies, 112 comprising (31%) of the respondents indicated they will opt to pay an increased fee for better waste management services. A minority of the individuals chose either to relocate (23.6%) to other areas with little or no fees while others (4.1%) indicated they will opt to close down their businesses if waste management fees are to be increased. The breakdown of the results indicates that there is great need for consultation on waste management fee so as to get an informed view of the details from the different groups of residents.

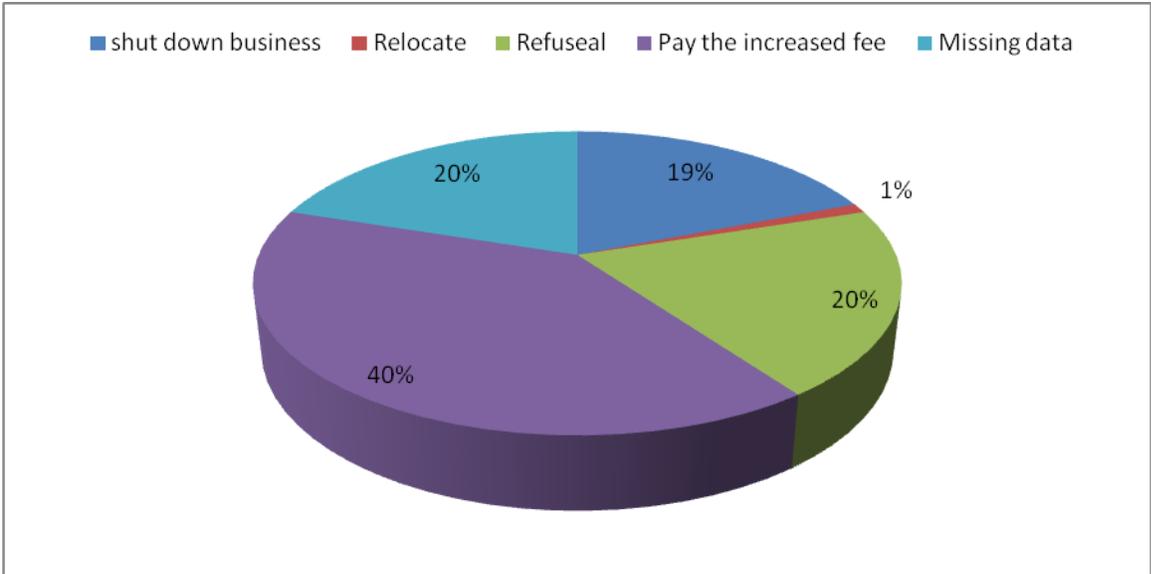


Figure 4.4: Informal squatter areas: Respondents' views about payment of an increased tariff for better waste management services.

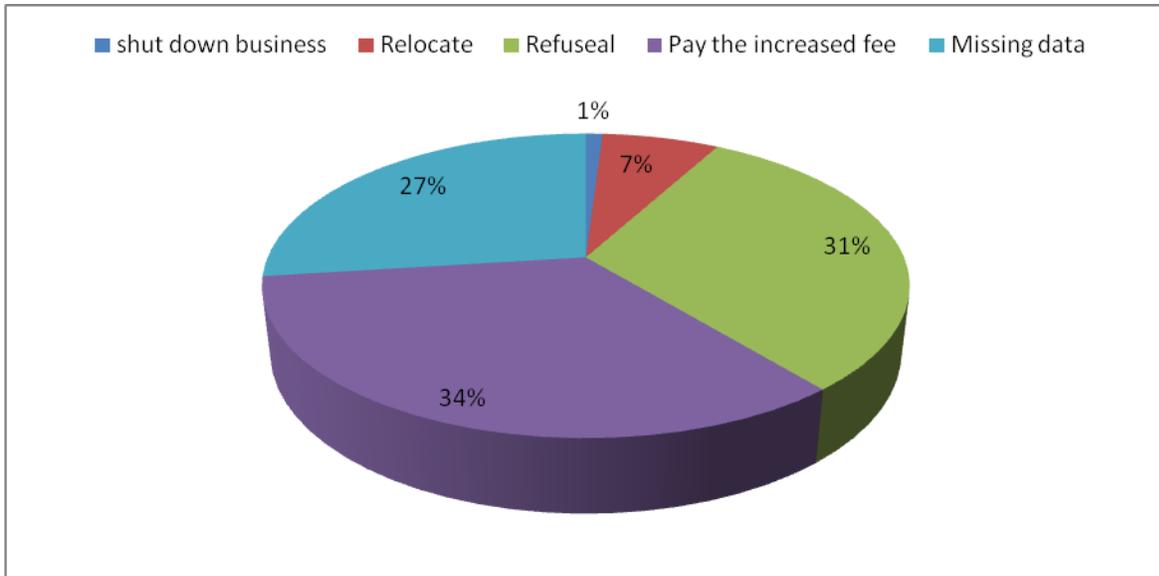


Figure 4.5: High density formal areas: Respondents' views about payment of an increased tariff for better waste management services.

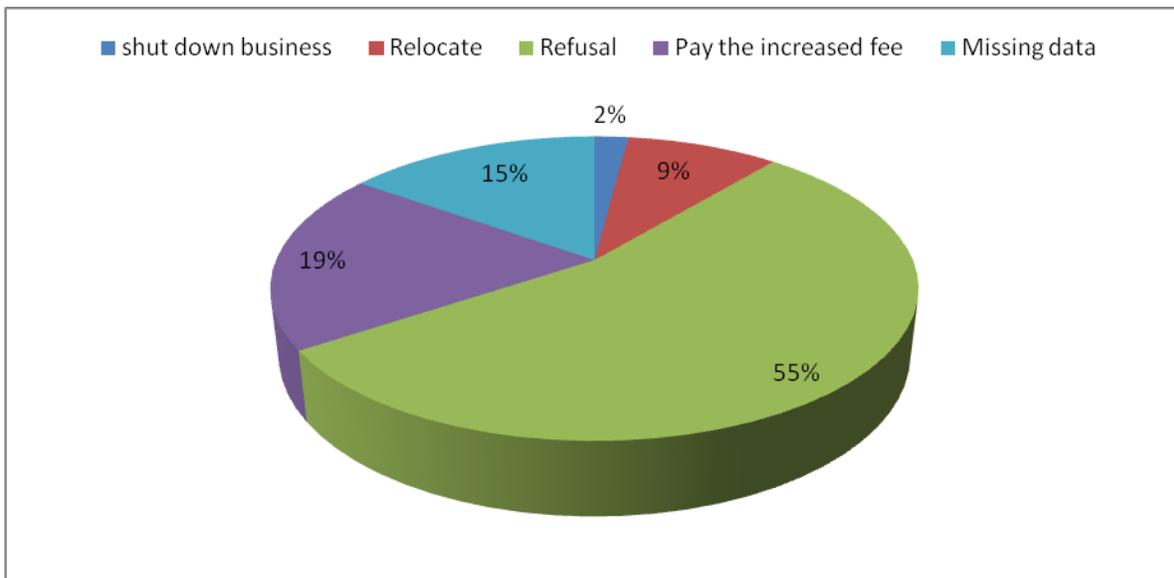


Figure 4.6: Formal medium density areas: Respondents' views about payment of an increased tariff for better waste management services.

According to Figure 4.4, Figure 4.5 and Figure 4.6, the results show that informal residents are more willing to pay an increased fee for waste management services compared to the residents of the formal areas with the medium density formal area residents showing the least interest in payment of an increased fee. This might be because most of the informal

respondents are not currently paying and are living with a huge waste problem; hence they are willing to pay so as to get the waste management services. The formal medium density residents also indicated with the highest frequency their intentions to refuse paying any increased fee, with 96 of the respondents (54%) showing such results (Figure 4.5). This could probably be due to the fact that they are getting an unacceptable or an insufficient service for what they are paying currently. On the other hand, 31% from the high density formal areas also indicated their refusal to pay any increased fee if it were to be the case (Figure 4.6). Finally 20% from the informal squatter settlement areas also indicated they are not willing to pay any such increase (Figure 4.4). A larger percentage of the respondents from the informal settlement areas indicated their businesses will be affected and will have to shut down if waste management fees are increased (19%) compared to only 1% and 2% of the respondents from the high density and the medium density formal areas respectively. A minority group will opt to relocate in such circumstances while others did not respond to this question (1% from the informal areas, 7% and 9% from the formal high density and medium density areas respectively) probably due to the fact that they were undecided in their response to this question. Some participants in this study did not respond to this question. These include: 20% from the informal squatter residences, 27% from the formal high density areas and 15% from the formal medium density areas.

4.2.8 Integrated Waste Management Planning in Ekurhuleni

According to the Gauteng Provincial Integrated Waste Management Plan (GPIWMP), a requirement of NEMWA, it is a prerequisite to involve all major stakeholders when planning for waste management strategies. The stakeholders will then 'claim' ownership of any projects identified for the purpose of waste management. It was noted during this study that most participants in this study indicated not to have any interaction with the municipality. This was reiterated in the responses received from the Waste Manager as he declares that residents were not involved during the planning of waste management strategies.

The Chi-square test was used to test the level of difference between the observed and the expected value describing the level of municipal waste management interaction with community members. According to Chi square test there is a difference between the variables

waste management interaction and no interaction between the respondents and the municipality. The Fisher's exact test was used to test the significance of the difference. The Fischer's exact test value is 15.805 while the p-value is 0.000 which indicates there is a significant difference between the expected and the observed levels of interaction. **Table 4.8** shows the standard residual values.

Table 4.8: Standard residual value for waste management interaction within the different studied areas

Study Areas	Standard residual values / Responses	
	Interaction	No Interaction
Informal Squatter	-2.2	0.7
Formal High Density	3.1	-0.9
Formal Medium Density	-0.6	0.2

Comparing the standard residuals with the critical value of 0.05 (+/- 1.96), in terms of interaction the formal high density respondents show a significant over representation while the informal and the medium density respondents show a significantly low interaction rate. The high density respondents showed a slightly higher rate of waste management interaction with the municipality. The null hypothesis in this case is thus rejected in favor of the alternative hypothesis that waste management interaction is not a common practice between the environmental department of Ekurhuleni Municipality and its residents. The results can be summarized as:

$$\chi^2 (42, N = 356) = 15.805, p < 0.0001$$

The responses of the community with respect to their interaction with the municipality are shown in **Figure 4.7**.

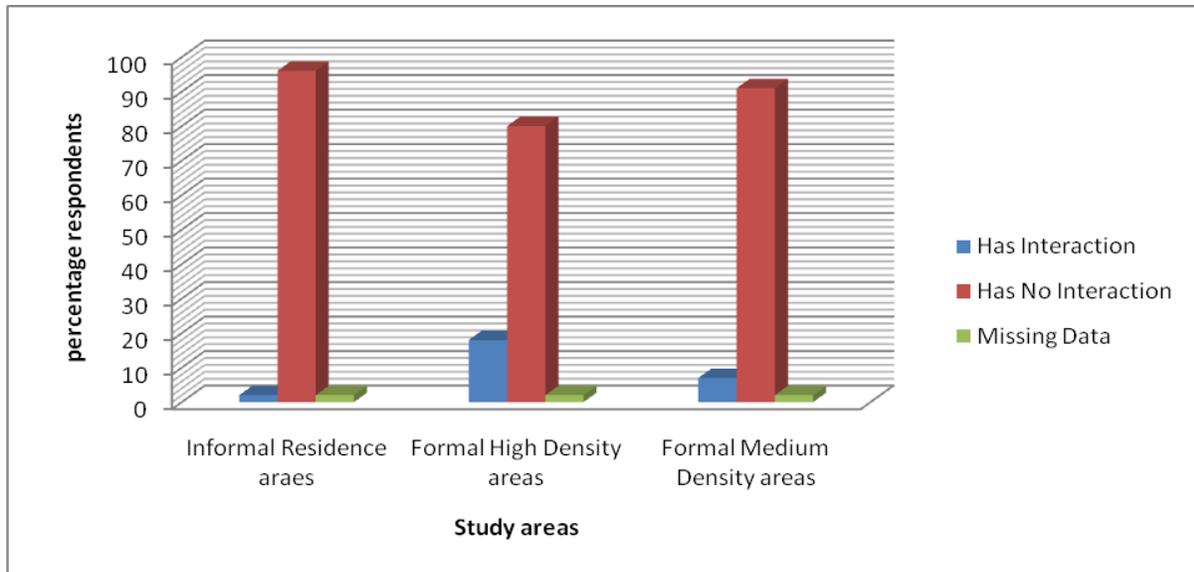


Figure 4.7: Respondents' level of interaction with the Ekurhuleni Municipality on waste management processes.

From the responses obtained from an interview with the Waste Manager for Ekurhuleni Municipality (July, 2011), the community members are not involved when planning for waste management strategies. Notwithstanding, a small proportion of the respondents from the different study areas indicated to having some interactions with the municipal councilors with respect to waste management. From Figure 4.7, only 7%, of the respondents from the formal medium density area, 18% and 2% from the high density and informal areas respectively have some interaction with the council on waste management related matters. On the other hand, a majority of the respondents making 96% from the informal areas, 80% from the high density areas and 91% from the medium density areas have had no interaction with the municipality.

Some community members, who care about their health and the environment, organize local meetings within their residential areas in order to effectively manage their waste independent of the council. A reflection of this is shown in **Figure 4.8**.

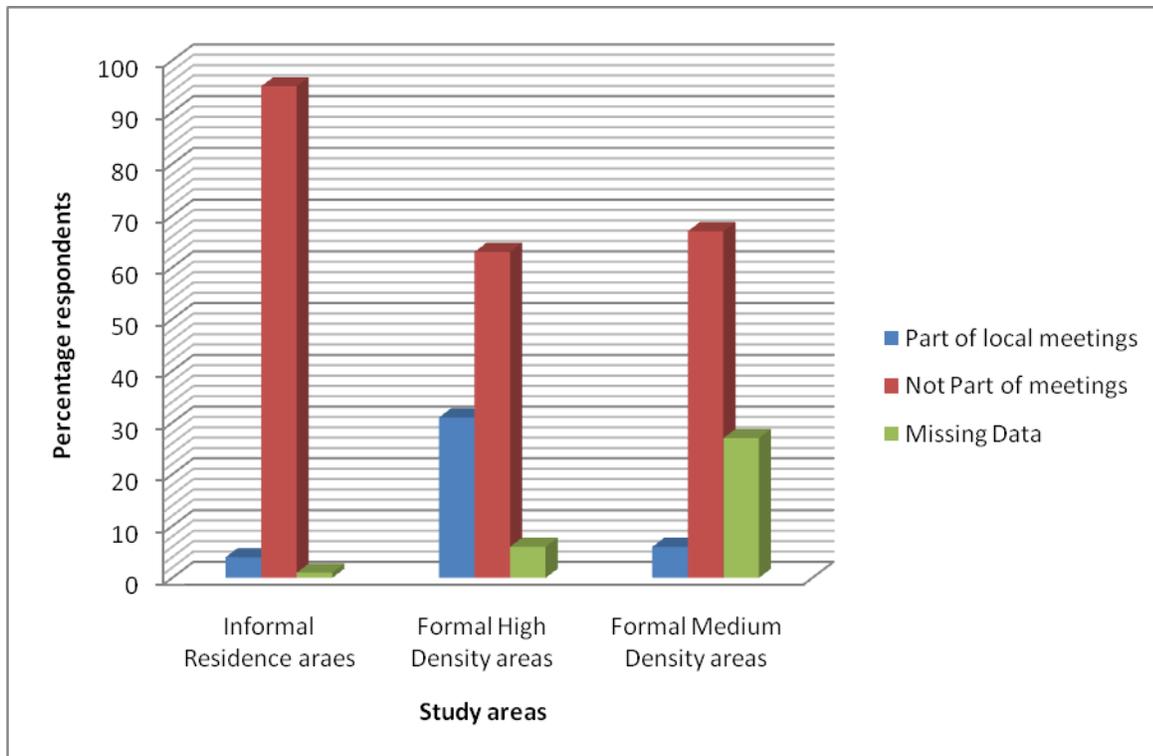


Figure 4.8: Ekurhuleni community based organized meetings for waste management

Locally organized meetings in the absence of the municipality’s intervention could be aimed at strategizing or lobbying for better waste management practices. Despite the prevalence of locally organized meetings, most of the community members are still not aware of it. Only 4%, of the respondents from the informal areas, 31% and 6% from the high density and medium density areas respectively indicated attendance to organized meetings focused on waste management strategies. A large proportion of the respondents making 95% from the informal areas, 63% and 67% from the high and medium density areas respectively have never attended any locally organized meetings related to waste management. A few participants making 1% from the informal density areas, 6% and 27% from the high and medium density areas respectively did not respond to this question which is insignificant as compared to those who responded. However most of the respondents expressed their interest in becoming part of any group which has an initiative on waste management as they are not yet exposed to such. According to the results obtained with regards to the formation of local meetings to strategize on waste management measures, the results were as shown in **Figure 4.9**.

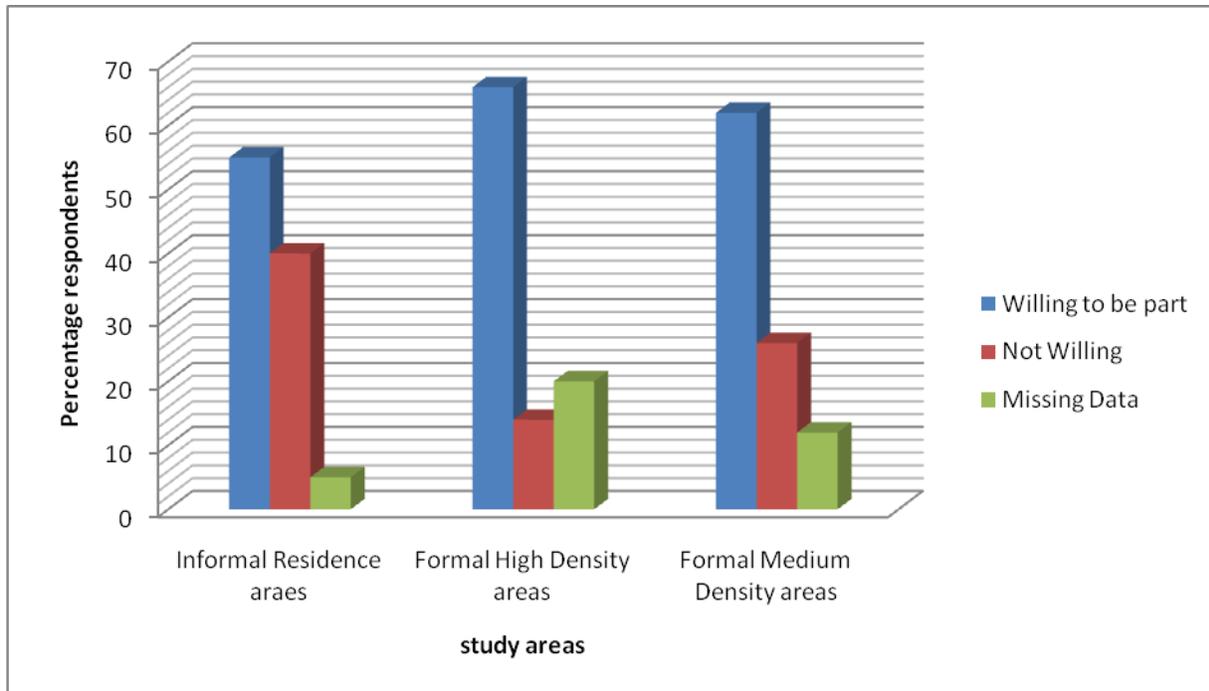


Figure 4.9: Respondents' willingness to be part of a waste management initiative group.

From all the three categories of the study areas, there is the general tendency that most of the participants in this research are willing to join any waste management initiative group if formed within their communities. Fifty five percent of the respondents from the informal area, 66% from the high density areas and 62% from the medium density areas showed their interest in joining any formed group for waste management initiatives. However 40% of respondents from the informal areas, 13% from the high density areas and 27% from the medium density areas indicated their willingness to be involved.

Sensitizing the public on any good community initiative such as on waste management is very important for effective public participation. With knowledge of the fact that locally organized meetings could be held for the purpose of strategizing and implementing better waste management strategies, the Ekurhuleni community members who have never been part of such meetings previously can decide to join such forums for the planning of more sustainable waste management strategies.

4.3 Landfill site disposal operation and management in Ekurhuleni: A case study of the Simmer & Jack landfill site

From the results, it seems that there isn't any waste management policy for this landfill site and/or that the workers have not been exposed to such a policy. The workers work according to instructions from the manager who comes to the site once in a while to monitor and advise on the activities. In the absence of the manager, they are land fill officers on site who facilitate the activities on the site. It is worth to note that this site looked very clean during the days when the observation and interviews were carried out despite the fact that the landfill site workers only work as instructed without being exposed to the policy on site.

From the results obtained during the landfill case study, it was revealed that none of the workers interviewed at the Simmer & Jack landfill site have ever had any formal training on waste management, including the site officers. They have all gained the required skills through experiential learning on the site, they learned on the job by practicing what they have been instructed to do and also by observing the more experienced workers do the job.

The type of waste that is brought onto the site is mainly general waste which includes domestic waste, rubble from houses and garden waste as the land fill site is licensed to receive such. This is a recommendation as per EMF for Ekurhuleni, thus the Simmer & Jack land fill site does not accept tinned food, liquids and light bulbs as these are considered hazardous.

As evident from the study, if a truck comes in with hazardous waste or waste that is not wanted on this site, it is referred to the Reitfontein land fill site or others that deal with hazardous waste. The waste received at this site is brought in by many different waste removal companies. Individuals are not usually allowed to bring in waste on the site except if it is of a certain prescribed load measurement.

One major waste treatment method that is used at the Simmer & Jack land fill site involves the "crushing and burying" of the waste. Garden waste is also composted and the compost is used as cover when burying the crushed waste. The landfill site has a very large surface area although the exact dimensions were not known by the field workers during this study. It was noted that the site has been divided into four sections whereby only a single section

alternating with the others is used during a given season. One section from the four sub sections at the site has already attained the end of its life span and has been rehabilitated with vegetation. The compost made on this site is also used as a “dressing soil”. This dressing will lead to the growth of new vegetation such as grass at the end of the life span of that portion of the site.

The land fill site has a life span of about 10 – 15 years. The site has been divided into 4 sections where only one section is used at a time; According to the interviewees, the following were identified as problems encountered at the site:

- The neighboring inhabitants of the site complained previously of the bad smell coming out from the site however at present, this is being well managed as all the waste deposited at the site is crushed and buried on a daily basis.
- The informal settlers invade the land fill site without permission to search for recyclable materials. This can be seen below in **Figure 4.10**.



Figure 4.10: People looking for recyclable material on the Simmer and Jack landfill site (Researcher: April, 2012)

- The people who come on the site without permission in search for recyclables cause a lot of litter on nearby streets close to the landfill site and also exposing them to health risk from the unwashed and broken equipment.
- There is a control gate at the entrance which controls the entry of the general public however there is no fence in the area where the scavengers use to gain entry into the landfill site.
- Littering sometimes occur around the site. Most litter around the site is caused by the incoming loaded trucks and the scavenging children.
- Most workers are negligent in protecting themselves as they do not always put on protective clothing yet it is known that it is dangerous to work at a land fill site without protection as one gets exposed to bacteria that infest the waste, sharps, dust noxious gases and smells.

On the flip side, the land fill site has some potential in solving some of the problems encountered on the site. For example:

- ✓ It is equipped with different equipment and these include: the bull dozer, crash compacter or waste excavators, the tipper trucks, the water trucks and the tractor. A trailer is attached to the tractor purposely for use in litter collection from the entrance and around the site.
- ✓ The workers are provided with protective masks, gloves and even safety boots to use when on the site although. Although most of the workers do not protect themselves, an example of a worker using the appropriate protective gear on duty on the Simmer & Jack land fill site can be seen in **Figure 4.11**.



Figure 4.11: The use of protective masks, glasses and gloves during work on the Simmer & Jack landfill site (Researcher: September 2011)

On the landfill site, underground pipes have been installed from the buried waste to collection tanks called the refer machine for the collection of usable gas from the waste. The gas (methane) has for sometime been used by Eskom, but the project has not been sustainable due to the low capacity and the unstable nature of the “refer machine”. Presently, the gas collection process has stopped as the machine is being replaced with that of a higher capacity (Simmer & Jack landfill Site worker, September 2011).

There is also a leachate dam which serves as a reservoir and collects waste water (leachate) from the landfill through underground pipes.

The recyclable wastes that are being accepted separately on the site are oil and glass. These are carefully stored in separate collection tanks and when there are up to a certain amount, there are paid for and collected by the different recycling companies, for instance “Consol Glass” picks up the glass material for recycling.

An operational weigh bridge facility is in place and functioning well for the estimation of the amount of waste entering the site. Trucks bringing waste are charged according to the kind and quantity of waste.

The weigh bridge attendant admitted that she has no knowledge of waste management as she was formerly a cleaner on the site and was promoted to work at the weigh bridge due to her hard work and interest in computer literacy.

The following rules are there to guard the activities of the land fill site. These rules are displayed on a notice board at the entrance into the site.

- Only general non-hazardous waste should be disposed on the site.
- The contractor is legally bound to operate the site strictly according to contract and instruction from the operating contractors
- The site is used at the users own risk
- The dumps and the containers should be inspected at the weigh bridge prior to disposal
- No sealed containers are accepted on the site
- Empty containers displaying hazard are not allowed on site
- Waste is disposed off only on the demarcated areas
- Site users are responsible for off loading
- Composting garden refuse must be deposited at the allocated site
- No reclamation / scavenging will be allowed on site or at the public disposal containers
- Scavenging with vehicles will lead to blacklisting of vehicles
- No open fires are allowed on site
- Speed limit of vehicles must be kept at 20km/h
- Open trucks must be covered with properly installed nets
- Children are not allowed to enter the site
- No vehicle may exceed the legal pay load.

Although these rules are clearly displayed at the entrance of the site, not all the rules are being strictly followed; e.g. people still manage to get into the site illegally and search for recyclables.

4.4 CONCLUSION

Waste management is a challenging activity within communities. The Ekurhuleni Municipality as an example faces waste management problems due to many reasons as evident in the results of this study. Although the municipality is doing much to comply with the requirements of NEMWA, there still exist challenges that lead to ineffective or inefficient waste management within suburbs, townships and informal settlements of the municipality. The challenges encountered by the Ekurhuleni Municipality with respect to waste management range from the lack of equity in the provision of waste management services to all members of its municipal area, inefficient or the lack of monitoring strategies in place for the different waste management activities and but not limited to the lack of awareness by the community members, of proper and sustainable waste management practices.

CHAPTER 5 DISCUSSION OF RESULTS, RECOMMENDATIONS AND CONCLUDING REMARKS

5.1 INTRODUCTION

With reference to the aim of this study, this chapter will elaborate on the differences between the requirements of NEMWA and the local strategic implementation of waste management practices within parts of the Ekurhuleni Municipality and also the differences in waste management practices between the informal and the formal areas that were covered during this study.

The National Environmental Management Waste Act (NEMWA 59 of 2008) provides guidelines which the different municipalities need to incorporate in order to efficiently manage the waste generated within their municipal area. The Waste Act sets a prerequisite for the different implementers (the different organs of the state which include the municipalities), to have developed an integrated waste management plan by the year 2011. It also advocates for the need of awareness of waste matters to be made known to the community members so that they can sustainably manage their wastes.

The Ekurhuleni Municipality has an IWM plan and an EMF which covers the implementation of this Act. Although the EMF and IWM plan are closely related to NEMWA, the municipality still has some challenges with respect to its efficiency in waste management. For example it was realized that the municipality is not doing enough to create public awareness in relation to waste management aspects as it is mandated to do. The municipality does not equitably provide waste management services to all people of its municipal area as stipulated in the NEMWA.

5.2 Differences between the NEMWA requirements and the local strategic implementation of waste management practices within parts of the Ekurhuleni Municipality

Even though the municipality is said to have enough resources to cater for its waste, (Waste Manager for the study area, 2011) there are many gaps that have been identified during this study relating to the challenges that exist within the municipality's waste management sector.

The following are the gaps and challenges faced by the municipality with respect to waste management:

1. The waste generated at homes is not consistently collected as collection dates are changed without prior notice to the public.
2. The respondents complain that the frequency of waste collection per week is very low. Although according to NEMWA, the ideal frequency is once a week, some areas have their waste collected only once in two weeks or once a month. This could be due to the limited resources (including human resources) available to the municipality. There is also none collection of waste on rainy days. This leads to many households having to put up with uncollected refuse and thus the possibility of using burning and illegal dumping as alternatives for dealing with their waste.
3. The sizes of waste receptacles provided are too small. This leads to littering and scavenging by dogs when the containers are full and collection days skipped. Although larger receptacles may lead to more waste being generated, the ideal could probably be to increase the number of collection days.
4. Littering by waste collection personnel and from the trucks occurs during collection causing pollution and aesthetic disturbances. This is contrary to what NEMWA postulates as to the fact that littering causes a nuisance in the environment.
5. Under developed recycling system as there is no proper municipal recycling program and recycling facilities. For example there are no separate bins for sorting out waste probably due to the lack of the necessary resources needed in the provision of such containers. This can be seen to contradict the waste manager's views of the municipality having enough resources to cater for their waste. The underdeveloped recycling system leads to low recycling rates and increased volumes of recyclables reaching the landfills. NEMWA and the Polokwane Declaration require a very significant reduction of waste that reaches the landfill sites.
6. Levies are being paid for the waste collection services in the Ekurhuleni Municipality as stated in NEMWA. The municipality has taken upon its discretion to set out the fees according to its financial needs in the waste management sector as required by NEMWA. However, the fee collection is not being well enforced as some respondents

from the formal areas do not pay the fee and a few others only pay at times. The financial resource available for waste management services therefore becomes limited. It therefore becomes very difficult to effectively collect all the waste generated in the municipal area with limited financial resources. The respondents from the informal squatter settlements do not also pay tariffs for waste management services. Financially it will be challenging to cater for waste generated from such areas, thus leading to piles of waste accumulating in-front of the residential areas.

7. Most of the participants in this study have not had any form of waste management training and such community members will not be able to do the basics of the waste management process such as sorting of waste prior to disposal.
8. As one of the aims of NEMWA is to promote good health, and that landfills should not be located near residential areas, it is significant that landfill sites should not be situated at the proximity of residential premises. The Simmer & Jack Landfill site is situated in an area that is close to human residences (about 30 to 50m) thus posing human health risks. Ekurhuleni is in a challenging position as it is stated in the EMF for Ekurhuleni, 2007 that the municipality has limited “spare space” that can accommodate the creation of land fill sites as most of the land fill sites within the municipality have a limited life span left about 10 – 15 years.
9. The Gauteng IWMP is a waste management plan that should ideally involve all the relevant stakeholders in waste management strategies. The stakeholders need to be involved from the planning to the implementation of the plan. IWMP is a very important requirement for waste management as stipulated in the NEMWA document that municipalities must have an integrated approach to waste management. Such an integrated approach to managing waste can only be successful if the relevant stakeholders are educated on its benefits and manner of implementation. According to the results obtained during this study, it is noted that very few respondents declared that they have a waste management interaction with the municipality thus the municipal IWMP does not seem to be functional. The Ekurhuleni Municipality therefore has a lot to do to meet this requirement of the IWMP.

10. According to NEMWA, municipalities must design or adapt the existing Waste Management Act / policy to suit their respective context. In NEMWA, chapter 2, part 2, section 8/9, municipalities are expected to “set local standards for the management of solid waste that is disposed off by the municipality or at the facility owned by the municipality....” The municipality is also expected to set local standards with respect to specific waste treatment and disposal facilities. It is in this regard that the Simmer & Jack landfill site management has developed rules in which the landfill is operated. One of these rules is that the site is “out of bounds” to scavengers but unfortunately this is not practical as scavengers are continuously on this site scavenging for recyclable material for either their personal use or for sale to recycling companies. The scavengers actually face some health risk as they dig into the waste without any protective clothing such as nose masks, protective hand gloves or boots. It was also noted that these scavengers cause a lot of littering on their way in and out of the landfill site. The municipality or the landfill management is therefore required to enforce the monitoring of this rule without which the sustainability of its waste management at the Simmer and Jack landfill site is going to be negatively affected.
11. Safety at the landfill site is a pre-requisite that needs to be ensured. Although the interviewees acknowledged that they are provided with safety boots, hand gloves and eye glasses for using on the site, only one worker actually had this equipment on the days of the site observation. Safety compliance should therefore be made compulsory to the entire site workers at all times.
12. NEMWA has been in existence since 2008, but the land fill site workers are not exposed to this Act and its requirements with respect to waste management. The workers that participated in the interview acknowledged they had low educational levels. This might render them a cognitive barrier, such that finding out about, reading and understanding the Act might be challenging.

5.3 Differences in waste management practices between the informal and formal studied areas of the Ekurhuleni municipality.

It is very challenging to maintain equity in service delivery between the well planned formal areas and the informal squatter, poorer communities. Waste management is one of those services that do not need to be compromised as improper waste management leads to fatal effects on the biophysical environment regardless of whether the community is affluent or not. The following were realized as the areas of difference with respect to waste management practices between the informal areas and the formal areas of some parts of the Ekurhuleni Municipality.

In the disposal of waste almost all the community members from the formal areas who participated in this study make use of the municipality's large trucks for the collection of their waste. Some respondents from the informal areas still burn their waste though, or go directly to the dump site to dispose their waste. The ideal according to NEMWA is to provide equitable services to all the people within the municipal area but this is not the case in the Ekurhuleni Municipality as most participants in this study from the informal residents do not benefit from the waste collection services offered by the municipality.

The frequency of waste collection differs in the formal and informal areas of the same municipality. For instance, while most members in the formal areas have their waste collected once a week, most members in the informal areas burn or dump their waste. This is in contrary to the municipal year calendar that has been provided for waste collection in all the areas within the municipality. The waste collection calendar for instance indicates the collection days for Germiston formal residences but this collection is not effected in the informal areas.

According to the Department of Environmental Affairs and Tourism, (DEAT, 2007), individuals are encouraged to embark in waste management activities that can lead to the generation of income. As an example community members can get involved in operating buy-back centers or recycling depots. A buy back center is a place where people bring waste for sale. They are paid for the waste they bring and a recycling depot is a place where people are not always paid for the materials they bring in for recycling (DEAT, 2007). The DEAT (2007) also

recommends that community members can organize and get their waste in a central point which will then make it easy for the council to collect from only one central point. This system can be useful for the communities such as informal settlements that are not very accessible and do not benefit from the municipality's waste collection services. It will also be beneficial in ensuring a more sustainable waste management strategy if such a system is adopted in the Ekurhuleni Municipality.

For efficiency to be realized in waste recycling, it is necessary to sort out waste before disposal. It has been realized from this study that the formal medium density area residents are less concerned with sorting out waste as this is mainly practiced by members of the poorer high density formal area and informal communities. Members of the informal and high density formal communities are generally low in income and as such sorting is done mainly for recycling to earn money and for re-using the waste as a beneficial resource. NEMWA addresses the issue of reducing, re-using and recycling waste in order to reduce the waste that is finally disposed off and to have a paradigm shift from the system that focuses on the end of pipe treatment of waste to that which involves the prevention of pollution and minimization of waste (NEMWA Act 59 of 2008). In the case of the Ekurhuleni Municipality most of its residents are not yet informed about the importance and necessity of sorting out their waste before disposal. It would be more effective if the residents from the formal medium density area sort for recycling purposes because by virtue of their better incomes, they probably consume and produce more waste. The municipality needs to facilitate recycling in both the formal and the informal areas under its jurisdiction.

Waste management tariffs facilitate proper waste collection and treatment services as they ensure sufficient funding needed for the provision of necessary resources for such services. It is stated in NEMWA that municipalities have the discretion to decide who and how to charge fees for the services. The Ekurhuleni Municipality implements this as confirmed by the waste manager for the studied area. According to the Ekurhuleni waste management policy, not every community member is expected to pay equal tariffs for their waste management services. The policy does not however state whether or not the members of the informal squatter areas are expected to pay for waste management services. From this study, it was realized that the respondents from the informal squatter settlement areas do not pay any tariffs

for waste management services. This probably makes it difficult for the municipality to provide equitable waste management services to all its inhabitants. This non paying factor experienced by the informal residents can be associated with the fact that most of the dwellings in such areas are unplanned and thus not registered which makes it very difficult for proper records to be made and as such challenges in allocating them with the necessary tariffs. A human settlement policy aimed at the development of houses simultaneously with other developmental projects was adopted by EMM. Its intention is to ensure that the required capital is aligned with the operational budgets so that housing developments can occur simultaneously with the development of clinics, libraries, schools, community centre, taxi ranks and sports facilities. Child headed households are becoming very common and as such inhabitants of such households are vulnerable to the effects of poorly managed waste. There is therefore a call for tenders that will facilitate the registration of informal settlements, especially those of child-headed households who appear to be the most vulnerable (Huchzermeyer *et al*, 2004). Huchzermeyer *et al* (2004) also commented that it was the intention of the municipality to provide permanent basic services to the dwellings if they found out that the informal dwellings will be upgraded in the near future. Though the percentage of formal dwellings in Ekurhuleni has increased slightly since 2001, after the last census (Informal Settlements in Gauteng, 2011) the rate of erection of informal settlements is also increasing due to population increase in the municipality. The municipality is finding it challenging to allocate all the immigrants with formal dwellings. It is thus probably due to failure to upgrade dwellings according to the standards that waste management services are still not provided to all members of this municipal area. Waste management is a very important part of the systemic societal activities but also a tedious and challenging activity. Challenges due to improper implementation of policies, poorly designed policies, over population, limited skilled waste managers and limited waste management infrastructures are noted in waste management (Zotos *et al* (2009), Odhiambo and Wekesa (2010), Dongo *et al* (2010), Nyenje and Okot-Okumu (2011), Ogutoyimbo (2012)).

The Ekurhuleni Municipality amongst other municipalities has gaps within its Waste Management Department which range from the poor implementation of NEMWA to the inequitable provision of waste management services within the different community types.

The participants of this study in the Ekurhuleni Municipality do not experience equity in terms of waste management service reception from the municipality. Most of the participants from the formal urban areas receive better waste management services compared to those from the poorer informal and high density areas. Most people who took part in this research in the Ekurhuleni Municipal area are not educated in terms of proper waste management practices at individual and even at the municipal levels which means that they are not involved in the municipality's decision making regarding waste management practices.

It is thus required that either the waste act be properly implemented or adapted to suit the municipality's context or some further studies be done on how to close these gaps.

5.4 RECOMMENDATIONS AND GENERAL REMARKS

An evaluation of the implementation of waste management strategies in the Ekurhuleni informal and formal areas in relationship to the National Environmental Management: Waste Act 59 of 2008 was made during this study. Based on the results here, a number of recommendations can be made which can guide the municipality's activities with respect to the effective implementation of waste management strategies. Proposals on what needs to be studied further in relation to investigating the problems and or bringing forth solutions to the problems within the waste management sector of the Ekurhuleni Municipality are also discussed.

5.4.1 Recommendations on the waste management activities for the Ekurhuleni Municipality.

The following will probably lead to a better or improved waste management strategy, enhancing the closure of some of the existing gaps between the waste management practices in the Ekurhuleni Municipality and NEMWA. These recommendations are considered to be answering the part of the research question which focuses on how the analysis of the gaps in the Ekurhuleni waste management practices can enable the closure of the gaps.

- While according to NEMWA municipalities have the discretion to determine who pays for waste management services, it is challenging to impose such tariffs to the informal residents as most of the land they occupy have not been officially demarcated nor

registered with the municipality (Ekurhuleni Waste Manager, November, 2011). And also considering accessibility problems in the unplanned informal settlements waste drop off areas at central accessible points are recommended. This should be made in such a way that it is not expensive for both the residents to drop off waste and the municipality during collection. It is important that the area be well protected against children and scavengers to prevent potential health risks. It should be a rule that unsorted waste must not be taken to the site. The activities of such a site should be strictly monitored to ensure its sustainability.

- All the Ekurhuleni community members should be empowered through the provision of education and skills on waste management to increase their levels of participation in waste sorting at the source of generation to foster effective recycling by the different recycling companies and income generation from such projects. This will be particularly advantageous to the unemployed, poor and informal dwellers that can embark in collecting the recyclables from the different residences and selling them to the recycling companies to earn a living. This should however be done with a permit and safety clothing which include uniforms, name tags and specific area of collection to avoid possible criminal practices by the collectors.
- The informal dwellers also need to be provided with the necessary skills and space so that they can construct well planned houses for themselves. The municipality through assistance from the government may decide to subsidize the project and if this decision is made, the land occupied by the illegal dumpsites could be used for the residential project. This will reduce the funds for the project as there is already an available space for the construction. The provision of such construction space will enable the construction of planned houses that will be registered and whose waste management can be monitored by the municipality.
- The municipality needs to involve stakeholders from the different sectors of the municipal area in the planning and implementation of waste management strategies. This can be done by advertising their planning meetings in advance and inviting group leaders from the different community based social groups to attend the planning meetings. These leaders can then serve as links between the council and the community.
- There is an existing environmental awareness system currently in place within the Ekurhuleni Municipality but in line with the results obtained during this study, most

participants in this study are not yet exposed to it. The community based environmental education system within the municipality should therefore be activated where there will be the creation of awareness on waste management issues. With this, communities could be motivated to manage their own waste through the organization of public clean up campaigns. Community members should be encouraged to own simple cleaning equipment like spades and outdoor brooms which can be used during clean up campaigns. Training should also be provided on how to use the tools. This will allow the residents to take part in cleaning up their own communities and minimizing waste while saving on cost from the municipality. It is important that the municipality identifies and encourages existing locally organized meetings for the purpose of waste management as according to GPIWMP, emphasis are laid on the importance of communities to create long term IWM approaches. Ward councilors and community leaders should be informed and involved in such environmental education programs. The environmental education program that can lead to waste management education can further lead to the creation of jobs for the unemployed. Land fill workers should also be trained formerly so as to enhance the efficiency of their jobs.

- A system approach to integrated waste management will also be a sustainable strategy for waste management. According to Godfrey and Oelofse (2008) this approach makes use of the strategic analysis of all the causes of the gaps that exist within waste management policies or during the implementation of existing waste management policies. For example, if a gap existed due to the lack of roads and other infrastructures in the informal settlements, then instead of abandoning the informal settlements and not collecting their waste, other approaches can be used such as encouraging some enthusiastic community members to collect the waste to a central point where the collection trucks can reach.
- Stinnette (2007) stresses the importance of having a monitoring strategy for the different waste management activities which will ensure a more efficient and sustainable waste management strategy. On this note, monitoring strategies should be used to monitor all the service providers for waste management services for the municipality making sure the job is being effectively done. This can be ensured by introducing a check list system where all the daily activities are listed and checked by the different responsible personnel. The landfill workers must be monitored and advised to always comply with the health and

safety requirements while on duty. Landfill workers should also be educated on the existing policy with which the landfill site functions.

- Waste collection workers should always be in identifiable uniforms when on duty for security reasons and the waste collection truck drivers should be cautioned against littering during the collection process.
- Municipal residents should be educated and encouraged to abide with the current by laws regulating waste management for the municipality. For instance not including hot objects in the provided bins which can cause fires, burning of waste, sorting of waste or illegal dumping and this should be monitored by appointed law enforcement personnel.

5.4.2 Recommendations for further studies towards the development and implementation of better waste management strategies in Ekurhuleni Municipality.

An improved study in the waste management department will probably lead to better strategies in the management of waste. The following are proposed topics that if researched further, will lead to an improvement on the waste management strategy in particular and environmental health in general.

- A research on the different methods and strategies suitable for carrying out environmental education intervention programs to the public of Ekurhuleni since environmental education is not very visible in the school curriculum as a single subject, will be required. The lack of capacity such as the required knowledge and skills at the level of implementation of the designed waste management policies and management strategies will possibly form the major hindrance to an efficient waste management practice.
- An action research on how sorting at the source and recycling of the waste can be possible and increased within the municipality thus leading to the minimization of waste that goes to the landfill sites, which is a major point considered in NEMWA, is necessary. This will encourage an aligned focus on the waste hierarchy.

5.5 CONCLUDING REMARKS

The interrelatedness of the different environmental dimensions makes the environment on one hand sustainable but on the other hand vulnerable to the different human activities. Waste management can thus be considered challenging due to man's dynamic way of thinking. Every individual has a particular way in which they perceive the environment as described in the personal dimension of the Van Rooyen model for EfSD (2006). This therefore makes the designing and the implementation of rules and regulations that cater for the sustainable management of waste challenging.

This research was primarily aimed at evaluating the gaps and challenges that exist in the waste management strategy in the Ekurhuleni municipality through the evaluation of the National Environmental Management: Waste Act 59 of 2008 in relationship to the Ekurhuleni waste management strategy. Secondly, it was aimed at studying the differences that exist in the waste management strategic implementation within the formal and informal communities of the Ekurhuleni municipality.

From this study, the factors that make, waste management challenging includes the lack of or insufficient knowledge about sustainable waste management practices and the poor or inefficient implementation of the existing governing policies or acts.

The specific challenges revealed after this study as experienced in the areas of Integrated Waste Management Strategy include:

- the challenges in allocating waste management tariffs to all the Ekurhuleni municipal residents,
- the nonpayment of levies by some residents within the formal areas of the municipality, and
- lack of sorting of waste at the source of generation and lack of awareness and training on good waste management practices to the community members in relationship to NEMWA requirements.

Differences existing in the waste management strategy that is employed to the informal and the formal urban areas are mostly on the frequency of waste collection whereby the informal residents do not have the privilege of having their wastes collected once a week as required and stipulated on the waste collection calendar. Almost all the formal residents have their waste collected as per the required frequency (once a week). Although locally organized

meetings are more common in the high density formal areas, it is the initiative of the community members to organize such meetings. It is thus necessary that the municipality enforces and encourages these initiatives.

The fact that the formal residents are levied for waste management compared to the informal residents, leads to a difference in the levels of waste management services provided by the municipality as the municipality is more obliged to offer a service to tariff paying clients.

These differences in waste management service delivery by the municipality can be overcome if the municipality strictly complies with NEMWA requirements according to their context and also ensuring sustainable payments and benefits for waste management services in the different geographical areas of its municipality.

Although both the high density and medium density studied areas are formal residential areas, noticeable differences occur within their waste management practices. It was realized that the high density area residents are more involved in waste management practices compared to the medium density area residents who are more affluent. A higher percentage of the respondents from the high density areas reduce waste disposal by sorting waste prior to disposal and are also more involved in the organization of local meetings for waste management compared to the medium density formal area respondents.

A case study done on one of the municipality's licensed landfill sites; Simmer & Jack landfill, indicated that the municipality is to some extent compliant with NEMWA, however in terms of formally trained workers it was found lacking. There is also no mechanism to keep away illegal users and scavengers from the site due to the lack of fencing around the site and the lack of monitors against scavengers.

Many challenges exist within the waste management practice in the Ekurhuleni Municipality as revealed from the analysis of both the qualitative and the quantitative data. However some necessary recommendations have been proposed which can possibly bridge the gaps that exist in the waste management sector of the Ekurhuleni Municipality.

Finally in as much as good national policies and strategies are enacted, it is very important to ensure that these are effectively implemented at the local authority level. There is need for the various stakeholders ranging from community, local authority and government to ensure effective implementation of sound municipal waste management.

“The waste Act is not the end, but a means to the end” (Oelofse, 2009), it must thus be implemented in a sustainable manner.

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ANNEXURE A: Ethical approval by UNISA to undertake a research project



Dr Antje Higgo
Chair: Ethics Review Committee, CAES

Tel: (011) 471 2984
Fax: (086) 642 7379
abartkow@unisa.ac.za

1 December 2010

To: **DR M Tekere**
tekerm@unisa.ac.za

Application for ethical approval to undertake a research project by student Fayeze

Dear Dr Tekere,

Your application for ethical clearance in respect of above mentioned study has been received and was considered by the CAES Research Ethics Review Committee.

The committee is pleased to inform you that ethical clearance has been granted for this study as set out in your application for ethical clearance as well as in the documents attached to your application.

Please be advised that the committee needs to be informed should your sampling method, interviews or other data sampling tools be adjusted after your pilot trial. In this case, a new application for the amendments needs to be submitted.

We trust that sampling and processing of the relevant data will be undertaken in a manner that is respectful of the rights and integrity of participants, as stipulated in the UNISA Research Ethics policy.

Congratulations on an interesting and relevant study. We would like to wish you well in this research undertaking.

Kind regards,

A handwritten signature in black ink, appearing to read "Dr A Higgo".

Dr A Higgo



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ANNEXURE B: PERMISSION LETTER ISSUED BY THE DIRECTOR FOR WASTE MANAGEMENT IN EKURHULENI MUNICIPALITY

Memorandum



To: Mrs Fayez Tembon

**ENVIRONMENTAL DEVELOPMENT
WASTE MANAGEMENT SERVICES
HEAD OFFICE**

Ref:
Fax:
From: **Director – Waste Management Services**
Z. Khathi
Email: zandile.khathi@ekurhuleni.gov.za
Date: 14 January 2010

Civic Centre
Trichardt's Rd, Boksburg
PO Box 215
BOKSBURG
1460
Tel: 999-5344/5699
Fax: 892-4502
www.ekurhuleni.com

Subject: **RESEARCH ON WASTE MANAGEMENT IN SELECTED AREAS WITHIN EKURHULENI METROPOLITAN MUNICIPALITY**

This is to confirm that we have received your written request to do research on Waste Management in the selected areas within Ekurhuleni Metropolitan Municipality.

The Waste Management Services Division grants you permission to do your research on the topic: *"Evaluation of the gaps and barriers that exist between the national policy and the implementation of waste management strategies between the more urban and more rural environments of the Ekurhuleni Municipality."*
We also request you to inform or send us your further findings on this research.

We hope that your research done within Ekurhuleni Municipality will help you to successfully complete your M A in Environmental Management.

Yours faithfully,



Z KHATHI
DIRECTOR: WASTE MANAGEMENT SERVICES

ANNEXURE C: DIFFERENT CONSENT FORMS

1. A REQUEST FROM THE MUNICIPAL COUNCIL: EKURULENI MUNICIPALITY.

Dear Sir / Madam,

AN APPLICATION TO CARRY OUT AN ENVIRONMENTALLY RELATED RESEARCH WITHIN THE EKURULENI MUNICIPALITY

My name is Mrs. Tembon, Fayeze and I am a student at the University of South Africa, UNISA with a student number 4590-065-5. I am currently registered for the Masters of Arts Degree in Environmental Management with Dr. Tekere M. as my supervisor. I am a resident of Germiston within your municipality.

The aim of this letter is to ask for your permission to carry out a research within our community. This is going to involve my interaction with the community members including the council workers of the Waste Management Sector, after seeking their consent. No personal details will be asked from any of the participants.

The aim of this research is to find out the gaps and barriers that are present within the waste management strategies that can hinder proper waste management. This is also aimed at involving the community as a whole in waste management practices.

It is believed that sustainability needs to begin from within our different homes before being channeled to the outside and together we can make this dream happen. I therefore plead for your indulgence and support of this study.

I look forward to receiving your feedback.

Thank you,

Yours sincerely,

Fayeze, Tembon

2. A CONSENT FORM REQUESTING THE PARTICIPATION OF THE EKURHULENI COMMUNITY MEMBERS

Dear Sir / Madam,

I am Tembon Fayeze, a student at UNISA. I am currently doing a research on waste management within our community. This research is aimed at looking at how we collaborate with the council to manage our waste. It is also aimed at identifying some of the problems that we or the council face during the process.

It is not compulsory that you have to partake to this study or you may decide to withdraw yourself from the study without being penalized by the researcher, but it will be very vital that you partake in the study and your participation will be highly appreciated. It is also important to note that any information received from you will be treated with confidentiality. If you have any further questions to ask, you are more than welcome to do so. Thank you for your time and for making the decision to participate in the research.

Fayeze Tembon.

3. CONSENT FORM IN ACCEPTANCE TO PARTICIPATE IN THE STUDY

I agree to take part in this research study being conducted by TEMBON FAYEZE, supervised by Dr. Tekere M at the faculty of Environmental Sciences within the University of South Africa (UNISA).

I have made this decision based on the verbal request and information read from this letter. All the procedures and risks have been explained to me and I have had the opportunity to ask questions and received additional information about the research.

I understand that I may withdraw from the study at any time without penalty, by telling the researcher.

I am aware that this research has received the necessary ethics and clearance from both UNISA and the Ekurhuleni municipality.

Signature of participant

Date

Signed at:

ANNEXURE D SETS OF QUESTIONNAIRES

1. A SET OF QUESTIONNAIRE DIRECTED TO THE WASTE MANAGEMENT OFFICIAL(S) OF THE EKURULENI MUNICIPALITY WITHIN THE GAUTENG PROVINCE OF SOUTH AFRICA

The following questionnaire will lead to the following:

Evaluation of the gaps and barriers that exist between the national policy and the implementation of waste management strategies between the more urban and more rural environments of the Ekurhuleni Municipality in the Gauteng province of South Africa.

INSTRUCTION: Complete the following questions by **ticking, (√), or filling in** where appropriate.

1. Sex

M	F
---	---

2. Age

--

3. Which specific area of the municipality do you manage?

--

4. Which of the following is your highest level of education

Grade 9 certificate	
Matric certificate	
Matric + one year tertiary education	
2 years diploma	
3 years diploma	

University degree	
Honors degree	
Masters degree	
PhD and above	

5. What was your area of specialty with reference to question 5?

--

6. Do you have any other knowledge or skills you obtained other than what you mentioned in question 4 and 5 above? If yes, please specify.

--

7. Which policy do you use in managing the solid waste generated within the municipality?

Local policy for Ekurhuleni	
National Environmental Management: Waste Act (NEMWA 59 of 2008)	
Both the Local Policy and National Environmental Management Waste Act	
Others – specify	

8. Are you able to interpret the policy with which you work?

Yes	
No	

9. If not, do you usually ask senior personnel for interpretation?

Yes	
-----	--

No	
----	--

10. Do you feel the policy with which you work within has sufficient information that will assist you in the management of waste?

Yes	
No	

11. If not list what you think is lacking in the policy.

12. Is there a general in- service training that takes place within your work department as to further educate and train you on specific and essential aspects within the waste management field?

Yes	
No	

13. How many dump sites are found within the municipality?

2	
3	
4	
Others- specify	

14. Do you think these numbers of sites are enough for the whole community?

Yes	
No	

15. What specific methods are being used in treating wastes at the dump site?

Burial	
Treatment with chemicals	
Incineration	
Others- specify	

16. How do you ensure proper disposal of the wastes?

17. Do you have enough resources to ensure proper waste management?

Yes	
No	

18. If No, what are the limitations?

19. Do you involve community members during the **planning** of waste management strategies within the municipality?

Yes		No	
-----	--	----	--

20. If yes, what criteria do you use in choosing the members?

21. Do you think the community members are cooperative with respect to encouraging proper waste management strategies?

Yes	
No	

22. If not can you list two possible reasons?

23. Do you usually consider the type of waste when planning for waste management?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

24. Do you usually consider the source of the waste when planning for waste management?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

25. Do you ever go out to monitor the community members as they manage their wastes?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

26. If you do, briefly describe the procedures that you follow.

.....

27. How often do you do this?

Once a week	<input type="checkbox"/>
Once a month	<input type="checkbox"/>
Once every 4 months	<input type="checkbox"/>
Once a year	<input type="checkbox"/>
Others - Specify	<input type="checkbox"/>

28. Is the municipality responsible for outsourcing waste management projects to private companies?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

29. Give an example of the different waste management companies that the Ekurhuleni Municipality liaises with for waste management purposes.

.....

30. What are the criteria used to select the waste management companies?

.....

31. Does the municipality inform these companies on what exactly to do or do they work based on their own company's policy?

.....

32. Which specific sustainable methods will you, as an expert in the field, recommend on the management of wastes?

.....

33. Is this method also specified in the National Environmental Management policy for waste management, (NEMWA, 59 of 2008)?

Yes		No	
-----	--	----	--

34. Do you find the NEMWA, 2008 act beneficial or just a guide line for waste management strategies?

Beneficial to the implementation of waste management strategies	
A guide line to the strategies depending on the context	
Both	

35. Please elaborate on the reason for your response in question 34.

36. Does the Ekurhuleni Municipality have its own policy that it works on when carrying out waste management strategies / services?

Yes		No	
-----	--	----	--

37. Do you (Ekurhuleni Municipality) make your environmental policies known to the community members?

Yes		No	
-----	--	----	--

38. If yes, briefly describe how you ensure this.

39. Are the community members expected to pay for waste management services (levies) offered to them?

Yes	
No	

40. If yes, who determines the amount to be paid?

41. Do all the inhabitants pay an equal rate for waste management services?

Yes	
-----	--

No	
----	--

42. Do you think there is an equal opportunity for both the inhabitants of the rural area, urban areas and the informal settlements within the municipality with respect to them receiving good (proper) waste management services?

Yes	
No	

43. If “no”, which group do you think is at a disadvantage?

Medium density formal	
High density formal	
Informal settlements	

44. What do you think can be done to rectify the situation in order to ensure efficient and equal benefits?

45. Briefly explain how sustainable waste management is ensured within the municipality.

46. Do you know about the theory “The tragedy of the commons”?

Yes	
No	

47. If NOT, then it is the theory that explains how humans misuse the environment because it does not belong to them but to the “commons”.

Have you experienced this within the municipality?

Yes	
No	

48. What has been done to remedy the situation?

49. Does the municipality also manage wastes from social sectors like the hospitals and from economic sectors like the mines?

Yes	
No	

50. If yes, then how do you manage the hazardous wastes generated from these sectors?

51. Do you use an Integrated Waste Management Plan as part of your local policy?

Yes	
No	

52. If yes, list three main points of focus within the plan that provides guidelines to waste management.

Thank you for your time and participation in this research, I hope this will assist in the careful analysis of informed decisions regarding our waste management strategies.

2. **A SET OF QUESTIONNAIRE DIRECTED TO THE COMMUNITY MEMBERS OF THE EKURHULENI MUNICIPALITY WITHIN THE GAUTENG PROVINCE OF SOUTH AFRICA**

The following questionnaire will lead to the following:

Evaluation of the gaps and barriers that exist between the national policy and the implementation of waste management strategies between the more urban and more rural environments of the Ekurhuleni Municipality in the Gauteng province of South Africa.

INSTRUCTION: Complete the following questions by **ticking or filling in** where appropriate.

1. Sex

M	F
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2. Age

--

3. Are you a :

Resident	
Business owner	
Employee	

within the Ekurhuleni municipality?

4. Which of the following areas within the municipality do you reside or work in?

Urban area	
Semi – rural area (Location)	
Squatter settlement	

5. Describe briefly the kind of waste generated at your home, business environment or your work place.

6. Describe how you dispose (throw away) your wastes by ticking from the following options.

Collection by large trucks	<input type="checkbox"/>
Disposal at dump sites	<input type="checkbox"/>
Burning by our residents	<input type="checkbox"/>
Others – specify	<input type="checkbox"/>

7. Is there a dump site close to your resident or business site?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

8. Do you usually sort out your wastes before disposing them off?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	Sometimes	<input type="checkbox"/>
-----	--------------------------	----	--------------------------	-----------	--------------------------

9. How often do the large trucks pick up your “plastic bags of wastes”?

Once a week	<input type="checkbox"/>
Twice a week	<input type="checkbox"/>
Once a month	<input type="checkbox"/>
Twice a month	<input type="checkbox"/>
Others - specify	<input type="checkbox"/>

10. Do you usually have some training on how to cater for your wastes by the municipality?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

11. If yes, how do you get this training?

Through circulars provided by the councilors	<input type="checkbox"/>
Through information from your residential contract	<input type="checkbox"/>
Through flyers provided on the streets / public places	<input type="checkbox"/>
Others – specify	<input type="checkbox"/>

12. Do you find the information informative and beneficial towards reducing or managing your wastes?

Yes	
No	
At times	

13. Do you pay any fee for disposing off or for the collection of your wastes?

Yes	
No	
At times	

14. Is the fee you pay equal, less or more than the services offered to you?

.....

15. Is there any specific problem that you face with the management of your waste? Specify the most crucial ones.

.....

.....

16. If the fee you pay was to be increased for the provision of better waste management services, will you:

Close up your business	
Relocate to another area	
Refused paying	
Pay the increased fee	

17. Do you know the importance of having a clean environment? List two importance

.....

18. Do you have any interaction (s) with the municipality in terms of waste management?

Yes	
No	

19. If yes, what is it?

.....

20. Do you have any written document issued by the municipality emphasizing such interaction?

Yes	
-----	--

No	
----	--

21. How do you think you can reduce the generation of your own waste?

22. Explain (list) two ways you think the municipality or the government can do to improve on our waste management services for better environments and health?

23. Are there any locally organized meetings in your area that focus on waste management strategies?

Yes	
No	

24. How often are such meetings held?

Monthly		Twice a month		Quarterly		Others specify -	
---------	--	---------------	--	-----------	--	------------------	--

25. Are you part of such meetings, and attend them?

Yes	
No	

26. If **No**, will you like to be part of such groups if formed to put together ideas on more efficient waste management strategies?

Yes	
No	

Thank you for your time and enormous contribution towards the effective and efficient management of our wastes.

3. A set of questionnaire directed to the Director: Waste Policy and Information Management Component, DEA South Africa

7th March 2012

From: Tembon, Mbamuku-Nduku Fayeze

MA Student, Environmental Management Department,

UNISA

Supervisor: Prof. M. Tekere

Student Number: 45900655

Dear Sir,

Thank you for your consent in responding to the questions in relation to waste management. The questions are based primarily on your presentation during a waste management conference organized by the Institute of waste management for Southern Africa (IWMSA) held at Mid Rand in February 2011.

Please tick (✓) the box where appropriate and provide a reviewed option where necessary.

No.	STATEMENT / QUESTION IN RELATION TO SOUTH AFRICAN WASTE MANAGEMENT	YES	NO
1	Waste generation is increasing in South Africa in an alarming rate which affects the waste management process. Review:		
2.	The state of the environment in South Africa is deteriorating as the generation of waste grows uninhibitedly such that the management facilities have not grown in line with the rate of waste generation. Review:		
3.	The high growth rate of waste generation is probably due to the growth in economic activities, consumerism and urbanization. Review:		

	The following are some of the reasons why there is a gap in the waste management practices in some South African municipalities.		
4.	The lack of proper infrastructure to efficiently manage the waste leading to burning of waste Review:		
5	There are leakages of drums in which liquid waste (bad chemicals) have been stored in some municipalities/ waste management sites. Review:		
	Animals and people scavenge in some of the landfill sites. Review:		
	Some equipment are dilapidated in some municipalities due to poor maintenance Review:		
	Some land fill sites are located around residential areas, hence residents turn to scavenge for recyclable materials Review:		
	The entrance to some land fill sites is not properly managed; hence waste is being dumped outside the entrance. Review:		
	The estimated cost to eradicate the illegal dump sites within the South African municipalities is about R980 million (Baloyi, Feb. 2011), Review:		
	Please provide any necessary action(s) that could be taken by: 1. municipal waste managers and 2. residents		

	to ensure sustainable waste management practices.		
	Any other comments:		

Thank you for your valued contribution to this research.

Sustainable waste management is the key to sustainable living and sustainable environments

ANNEXURE E

TRANSCRIPTION OF THE FOCUS GROUP INTERVIEW AT THE SIMMER & JACK LAND FILL SITE

In this transcription, the interviewer will be labeled "I" while the four interviewees will be labeled A, B, C, & D respectively.

I: Good morning, my name is Fayez and I am a student from UNISA.

A: wao, you are welcomed.

B: welcome

C: hmm

D: why are you coming here?

I: well, thank you for the welcome. I am coming here to study how things are done in this land fill site, actually how waste is being managed.

B: ah, do you want to work here?

A: what exactly do you want to know?

C: ok, we will help you

D: yes what do you want to know?

I: thank you so much gentlemen, before I go into finding out about the land fill site, I wish to ask some personal questions, I hope you do not mind?

A: No, you can go ahead

B: it depends on what you want to know about me

C: esh, I don't know

D: ok, no problem

I: Emm, I just wish to ask about your ages, em about how old are you people?

A: Laughing..... 34

B: ehs, me, I am old

C: 23

D: 30

I: Thank you very much; the next thing will be to find out how experienced you are with working on the land fill site. For how long have you been working here?

A: 7 years

B: 2 years

C: 3 years

D: 1 year

I: ok, good, what did you study before having this job? Did you study about waste management?

A: No, no waste management studies, I studied fire fighting at school.

B: ah, me I studied standard 3

C: I studied up till grade 10

D: I go to primary school.

I: Good, So how do you know how to do the things in waste management?

A: they just tell us what to do and we get used to it.

B: I learn from the other people

C: yes, we learn as we work

D: Me, I am new so I am still learning.

I: that's nice, so you people really learn fast. Now tell me what kind of waste do you people manage here?

A: general waste,

B: Domestic waste

C: Rubble from houses

D: even soil

I: ok but what do you mean by general waste? Do you also manage waste from the hospitals here?

A: No, that is considered as hazardous waste

B: general waste is just like all the plastics, paper, and garden waste

C: but we do not accept tins and left over food as we consider them hazardous

D: yes

I: Wao, how do you treat the waste on this site?

A: we basically crush the waste and mix it with soil

B: yes we burry the waste

C: sometimes we make compost which we use to cover the waste at the end of the day.

I: so you do not burn any waste here?

A: No, that is not allowed

B: we are not even allowed to smoke cigarettes on the site.

I: ok, do you know the amount of waste that comes in everyday?

A: Us here, no,... but the people at the weigh bridge might know.

C: but many trucks come in everyday

D: yes about 40 trucks a day, I can say.

I: what are the different companies that use this site to empty their waste?

A: many of them, like enviro waste, enviro serve, skip, many, you will see them coming in as we are even talking here.

I: I will see them actually because I plan to go around the site. How big is the site?

A: Very big really but we do not use all the site at once, we divide it into 4 sections and only use one at a time, when it is full we move to the next side.

B: Ehs ma, can I please be excused? I need to go.

I: yes, no problem you may go and thank you so much for participating in this.

I: what do you mean by "when it is full"? Was it empty before and how empty?

A: Ok, it was previously a mine that they dig underground so it is being used now like a dump site.

I: oh, I see! For how long can each of the portions be used before they "get full"?

C: I don't know

D: I heard 10 years

A: About 10 – 15 years.

I: so tell me, when all the portions are full where will another site be created?

C: May be, looking for another place somewhere else

D: I think they will go into the Marathon squatter and send all those people there back home and use the space. It is very large.

I: Emm. Ok, tell me, what are the different problems that you experience with waste management on this site?

A: My main problem is the people from this squatter close by, the Marathon squatter, they always come to scavenge and disturb our jobs.

C: they also litter on their way out and we have to pick up after them.

D: The people of Malvern over there used to complain that the place smells and they can't stay well at their homes but it has been long, they did not complain again.

I: what do you think you did differently that made them not to complain again?

A: I think it is because we don't leave the rubbish for the next day, we cover everything that comes in every day before we close.

I: Wao!, this was really great and thank you so much for your time. I hope you also enjoyed the experience.

A: No not really as the supervisor excused us to come help you.

I: Thanks, you are so kind. I will like to go around and see the site but I will wish to talk with the supervisor before I go round.

ANNEXURE F

Tariff in Rand value charged for the different kinds of waste deposited at the Simmer & Jack landfill Site. (Data from the Simmer & Jack Landfill Site – Weigh Bridge Office- Germiston).

Waste Description	Tariff in Rand / ton, VAT excluded
General public up to 1000kg	Free
Disposal of general and non-hazardous industrial dry solid waste by the general public and contractors, in excess of 1000kg	177,26
Disposal of clean compostable garden refuse by the general public and contractors in excess of 1000kg	91,57
Disposal of general and non-hazardous industrial dry solid waste by the general public and contractors from outside the boundaries of the metro	373,75
Safe disposal of products: Crushed / Buried	180,00
Clean building rubble (less than 300mm in diameter)	Free
Soil, usable as cover material	Free
Tyres – rim size up to 70cm in diameter (normal motor vehicle tyre)	20,70
Tyres – rim size up to 110cm in diameter (normal truck tyre)	32,50
Tyres – rim size up to 116cm in diameter and greater than 116mm in diameter (Earthmoving equipment)	230,00
Tyres cut or shredded per 1000kg or part thereof	172,50