

**A comparative study of municipal waste disposal practices and management in the Breede River District Council and the Cape Metropolitan Area.**

**Amanda Frantz**



**A minithesis submitted in partial fulfillment of the requirements for the degree of Magister Artium in the Department of Geography and Environmental Studies, University of the Western Cape.**

**November 2006**

**Supervisor: Professor G Pirie**

# **INDEX**

LIST OF FIGURES	V
LIST OF TABLES	VI
LIST OF PLATES	VII
LIST OF ADDENDA	VIII
ABSTRACT	IX
DECLARATION	X
ACKNOWLEDGEMENTS	XI
KEYWORDS	XII
ABBREVIATIONS	XIII
<b>CHAPTER 1 INTRODUCTION</b>	1
<b>CHAPTER 2 LITERATURE REVIEW</b>	5
2.1 WASTE GENERATION	6
2.1.1 Solid Waste Generation and its Classification	6
2.2 WASTE MANAGEMENT STRATEGIES	8
2.2.1 International Examples	8
2.2.2 The South African Situation	11
2.3 WASTE DISPOSAL METHODS	12
2.3.1 Open Dumps	12
2.3.2 Sanitary Landfills	13
2.3.3 Incineration	15
2.3.4 Exporting Waste	18
2.3.5 Animal Feeding	18
2.3.6 Composting	19
2.3.7 Recycling and Resource Recovery	20
2.3.8 Other Methods of Waste Disposal	23
2.4 WASTE DISPOSAL SERVICES	23
2.5 CONCLUSION	25
<b>CHAPTER 3 METHODOLOGY</b>	
3.1 RESEARCH METHODOLOGY	26
3.2 MOTIVATION FOR METHODS USED	26
3.3 DESCRIPTION OF INSTRUMENTS USED	27
3.3.1 Surveys for Organisations	27
3.3.2 Interviews	27



3.3.3 Observations	28
3.3.4 Secondary Data	28
3.4 SITE DESCRIPTION	28
3.4.1 Breede River District	28
3.4.2 Cape Metropolitan Area	31
3.5 SAMPLING PROCEDURES	32
3.6 RESEARCH LIMITATIONS	34
<b>CHAPTER 4 DATA ANALYSIS (Breede River District)</b>	<b>35</b>
4.1 RESULTS: PRESENTATION AND DISCUSSION-WORCESTER AND ROBERTSON	35
4.2 DEMOGRAPHIC DESCRIPTION	35
4.3 WASTE DISPOSAL ISSUES	39
4.3.1 Areas Serviced by the Respective Municipalities	39
4.3.2 Volumes Handled	39
4.3.3 General Monitoring	39
4.3.4 Municipal Regulations	39
4.3.5 Hygiene/ Standards	40
4.3.6 Future Developments	40
4.3.7 Municipal Waste Management Issues	40
4.4 WASTE GENERATION	40
4.4.1 Average Waste Generation Statistics	40
4.4.2 Source(s)/ Generation of Waste	41
4.5 STORAGE	41
4.5.1 Capacities of Containers	41
4.5.2 Type of Container used on Domestic Level	42
4.6 COLLECTION	45
4.6.1 Frequency and Days of Collection	45
4.6.2 Levels of Satisfaction with Times of Collection	48
4.6.3 Transportation/Transfer	48
4.7 RECOVERY AND RECYCLING	49
4.8 ULTIMATE DISPOSAL	50
4.8.1 Size/Capacity of Facilities	50
4.8.2 Methods Used	50



4.8.3 Landfill Sites	50
4.8.3.1 Access to Facility	52
4.8.3.2 Operating Times	52
4.8.4 Incineration	53
Medical and Toxic Waste and its Disposal	53
4.9 MANAGERIAL ISSUES	53
4.10 VARIATION IN WASTE DISPOSAL PRACTICES IN WORCESTER AND ROBERTSON	54
4.10.1 Collection and Transportation	55
4.11 CONCLUSION	55
<b>CHAPTER 5: DATA ANALYSIS: (Cape Metropolitan Area)</b>	
5.1 Cape Metropolitan Area	57
5.1.1 DESCRIPTION OF AREA	57
5.1.2 DEMOGRAPHIC PROFILE OF SAMPLE	60
5.1.3 Marital Status	61
5.1.4 Income	61
5.1.5 Education	62
5.1.6 Duration of Residency	62
5.2 WASTE DISPOSAL ISSUES	63
5.2.1 Waste Generation	63
5.2.2 Storage	63
5.2.3 Type of Container	64
5.2.4 Collection	66
5.2.5 Levels of Satisfaction with Service Delivery	67
5.2.6 Levels of Satisfaction with Time of Collection	68
5.2.7 Transportation/Transfer	69
5.2.8 Recovery/Recycling	69
5.2.10 Recycling	70
5.2.11 ULTIMATE DISPOSAL	71
5.2.12 Landfilling	71
5.2.13 Incineration	75
5.2.14 USE OF THE FACILITIES	75
5.2.15 MANAGERIAL ISSUES	75



## **CHAPTER 6 CONCLUSION**

6.1 Comparisons	77
6.1.1 Variations	77
6.1.2 Demographic Profile	77
6.1.3 Waste Disposal Issues	78
6.1.4 Storage	78
6.1.5 Collection and Transportation	79
6.1.6 Recovery and Recycling	79
6.1.7 ULTIMATE DISPOSAL	79
6.1.8 INCINERATION	80
6.1.9 CONCLUSION	80
6.2 RECOMMENDATIONS	80
6.2.1 WASTE DISPOSAL ISSUES	80
6.2.2 STORAGE	81
6.2.3 COLLECTION AND TRANSPORTATION	81
6.2.4 RECOVERY AND RECYCLING	81
6.2.5 ULTIMATE DISPOSAL	82
6.3 CONCLUSIONS	82
<b>REFERENCES</b>	84
ADDENDUM 1	88
ADDENDUM 2	89
ADDENDUM 3	95



## LIST OF FIGURES

Figure 1: Municipal Demarcations in the Western Cape, 2004	3
Figure 2: Waste management processes	5
Figure 3: Former Breede River District Council	30
Figure 4: Cape Metropolitan Area (Municipalities)	31
Figure 5: New Municipal Demarcation for the City of Cape Town and the Breede River District	33
Figure 6: Age distribution in the BRD	37
Figure 7: Profile of sections in Municipal department responsible for waste disposal	40
Figure 8: Comparison of storage containers in Worcester and Robertson	54
Figure 9: Comparison of collection frequencies in Worcester and Robertson	55
Figure 10: Cape Metropolitan Area	58
Figure 11: Education level of respondents in the CMA	62
Figure 12: Location of waste disposal sites and transfer stations in the CMA	74
Figure 13: Comparison of storage containers in the BRD and the CMA	79



## LIST OF TABLES

Table 1: Types and methods of waste disposal in Copenhagen, 1996	21
Table 2: Distribution of housing types in the sampled areas in the BRD	36
Table 3: Number of dependants per household the BRD sample	37
Table 4: Educational qualifications	38
Table 5: Duration of residence	38
Table 6: Average waste generated per month	41
Table 7: Type of temporal domestic storage container inhabitants use in the BRD	42
Table 8: Frequency of waste collection in the BRD	46
Table 9: Resident satisfaction with services	47
Table 10: Population distribution by race in the CMA	59
Table 11: Dwelling type in the City of Cape Town	60
Table 12: Distribution of housing types in sampled areas in the CMA	60
Table 13: Sizes of households in the CMA	61
Table 14: Duration of residence in the CMA	62
Table 15: Storage types and daily use	64
Table 16: Waste removal status in the City of Cape Town	66
Table 17: Frequency of waste collection in study area per household	66
Table 18: Resident satisfaction with services	67
Table 19: Status of landfill sites in the CMA	71

## LIST OF PLATES

Plate 1: Proximity of skip to flats	43
Plate 2: Oil drum storage container	43
Plate 3: Trailer - tractor system used to transport garden refuse	44
Plate 4: Skips found on corner of road	45
Plate 5: Refuse dumped at the back of informal home at Drie Bruggies, Worcester	47
Plate 6: Worcester Landfill Site	51
Plate 7: Rehabilitated landfill site at Robertson	51
Plate 8: Composting plant-Robertson	52
Plate 9: Storage of bins on staircase of flat	65
Plate10: Waste storage bins used for transportation	65
Plate 11: Device used to secure bins on ground floor of flats	66
Plate 12: Before and after collection	68





## **LIST OF ADDENDA**

Addendum 1: Interview Questionnaire: Organisations	88
Addendum 2: Interview Questionnaire: Households	89
Addendum 3: Additional Tables	95



## ABSTRACT

Solid waste management is a phenomenon that has been researched for many years. With the development of industries and commerce, waste inputs into waste management programs are crucial since these are the sectors responsible for the generation of waste and thus the inputs are invaluable when programs are formulated. In order to develop effective waste management strategies it is important to identify the source of waste generation and the processes that must be followed to minimize waste.

The objective of this research is to follow waste from generation to ultimate disposal and to case study why and how differences in waste disposal practices occur in the Breede River District (BRD) and the Cape Metropolitan Area (CMA). The sample size was 100 in total for both the study areas collectively. The method of collecting data was by means of questionnaire and organizational surveys. The findings of this research show that the disposal of waste is a concern and that respondents were aware of managerial shortcomings and the impact that the merger between municipalities in the Western Cape Province would have.



## DECLARATION

I declare that *A Comparative Study of Municipal Waste Disposal Practices and Management in the Breede River District and the Cape Metropolitan Area* is my own work, that it has not been submitted for any degree or examination at any other university and that all sources I have used or quoted have been indicated and acknowledged by complete references.

Amanda M Frantz

November 2006



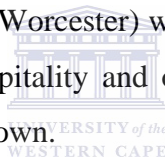
Signed:.....

## ACKNOWLEDGEMENTS

First and foremost I want to thank my Heavenly Father for the abilities I have gained in this research and other areas of my academic career. Without the grace and blessings nothing would have been possible.

Furthermore I wish to extend my appreciation to my supervisors Professor Gordon Pirie and Mr Michael Dyssel for their encouragement, patience, motivation and valued comments at various stages of this work as well as on other levels. If not for your tolerance I would not have been able to overcome all the obstacles that I faced while working on this thesis. You are much appreciated.

I further wish to thank all the households, officials and field workers who assisted who gave their time in completing and conducting interviews. Without their inputs this study would not have been possible. Also the strangers (Kobus, Aunt Maureen and family in Robertson and the Sefoor family in Worcester) whom I met and made me feel like part of their families, without your hospitality and open doors I would have spent more hours travelling to and from Cape Town.



A special thank you to my mother and family who has proved that patience certainly is a virtue. Without her support and motivation the completion of this work would not have been possible.

I also want to express a special thanks to David Turner for the emotional support and devoting time to assist where needed. Opinions expressed in this work, or conclusions arrived at, are those of the author.

Last but not least I would like to acknowledge and thank my sponsors for the financial support for the duration of my degree. The DAAD and SASAKAWA scholarship programs as well as the National Student Fund of South Africa. With your financial support the completion of this thesis would not have been possible.

## **KEYWORDS**

Composting

Incineration

Landfill sites

Recovery/Recycling

Solid Waste Management Practices

Transportation/Transfer

Waste

Waste Disposal

Waste Generation

Waste Management Strategies



## **ABBREVIATIONS**

BRD – Breede River District

CMA – Cape Metropolitan Area

WRC – Water Research Commission

DWAF – Department of Water Affairs and Forestry

DEA & DP – Department of Environmental Affairs and Development Planning

RDP – Reconstruction and Development Programme

NWMSDR- National Waste Management Strategy Draft Report



## CHAPTER 1 INTRODUCTION

An inevitable consequence of rapid population growth, consumer-oriented lifestyles and an increase in the pace of industrialization is an increase in the generation and volume of liquid, solid and gaseous waste produced. For these reasons, the management of waste is a major concern worldwide and it is becoming a problem in South Africa. According to South Africa's Environmental Conservation Act 73 of 1989 waste is defined as "...any object or matter discarded by the person in whose possession it was" (Fuggle and Rabie, 1992 p512). Nearly all human activities generate waste; this includes agricultural, industrial, municipal and commercial waste. As waste disposal resources are limited, an attainable and holistic waste management strategy must be established to make effective use of such resources. Poor management of waste disposal may lead inter alia to environmental health hazards. The protection of individuals (and, inherently, the environment in which they live), falls within the ambit of the South African constitution (Section 24 a) stating "that every citizen has the right to a clean and healthy environment and therefore effective waste disposal forms an integral part of waste management practices" (South Africa (Republic), 1996).



Similar to the differences in waste management in developed and developing countries, there are also waste management variations on regional and local levels. Urban areas are often deemed to be the most polluted and mismanaged areas, whereas rural areas on the other hand are seen as "unspoiled" environments. The latter however is not always the case, particularly due to the increase of tourism-related development in rural areas.

This study focuses on two areas, the Breede River District (BRD) (now Cape Winelands District Municipality), a rural area where primarily agricultural activities take place, and the Cape Metropolitan Area (CMA) (now City of Cape Town). These two areas characterize the urban–rural divide in the Western Cape Province (Figure 1).

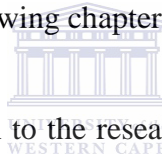
It is assumed that both waste disposal practices and related management systems will differ between the two areas. The study therefore aims to compare waste management practices in the BRD and the CMA in order to identify suitable and best-practice procedures.

Specifically, the study:

- i. Examines and compares solid waste disposal and management practices in the Cape Metropolitan Area and the Breede River District;
- ii. Investigates how residents perceive the waste disposal practices in relation to the services rendered by local authorities; and
- iii. Offers possible solutions and recommendations with regard to waste disposal and management problems.

The study will enable the researcher to recognize the level of adequacy in the two regions in terms of waste disposal practices and waste management strategies. The substance of the study has direct relation to the principles of waste management with a specific focus on solid waste generation, collection and disposal on a domestic level. The size and location of sites of waste generation and final disposal in the two areas are compared.

The main considerations in the following chapters are outlined below:

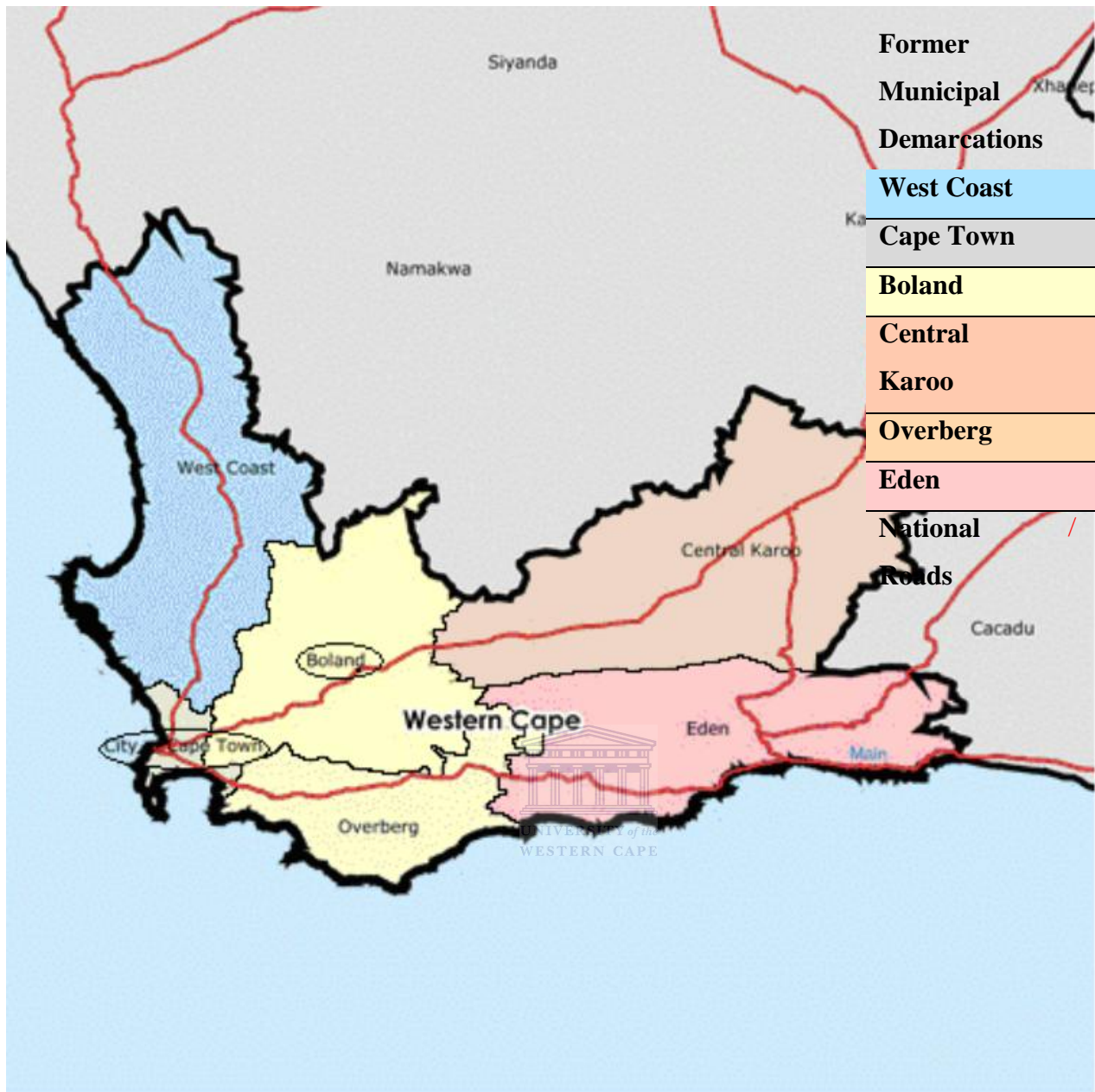


**Chapter 1** provides an introduction to the research problem. This chapter outlines the significance of the topic according to the aims and comparison of waste management. Furthermore, the approaches taken to acquire data are summarized.

**Chapter 2** describes solid waste management as a field of study and therefore the literature introduces the reader to solid waste management and processes. The generation of waste and how it is handled from generation to ultimate disposal, as well as the implementation of waste management strategies on local and international levels are discussed. An introduction is provided to waste disposal practices used in the study areas, which will be discussed in detail in the presentation of results.

**Chapter 3** describes the methods used to acquire data and introduces the study areas and the extent of surveying (including interviews, questionnaires and organizational surveys) that was done. The methods include the sample, where it was administered and what procedures were involved.





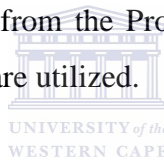
*Figure 1: Municipal Demarcations in the Western Cape Province (2004)*  
*Source:Internet<sup>1</sup>*

<sup>1</sup> [http://www.capegateway.gov.za/eng/your\\_gov/-online-10/09/2004](http://www.capegateway.gov.za/eng/your_gov/-online-10/09/2004)

**Chapter 4** presents and discusses the results of the research conducted in Worcester and Robertson (BRD) as well as data and information obtained from official sources. This chapter looks at the demographic description, handling of the waste from generation to ultimate disposal, and includes variations of waste disposal practices. The results obtained from the questionnaire and organizational surveys undertaken are discussed and include respondents' perceptions on the disposal and management of waste.

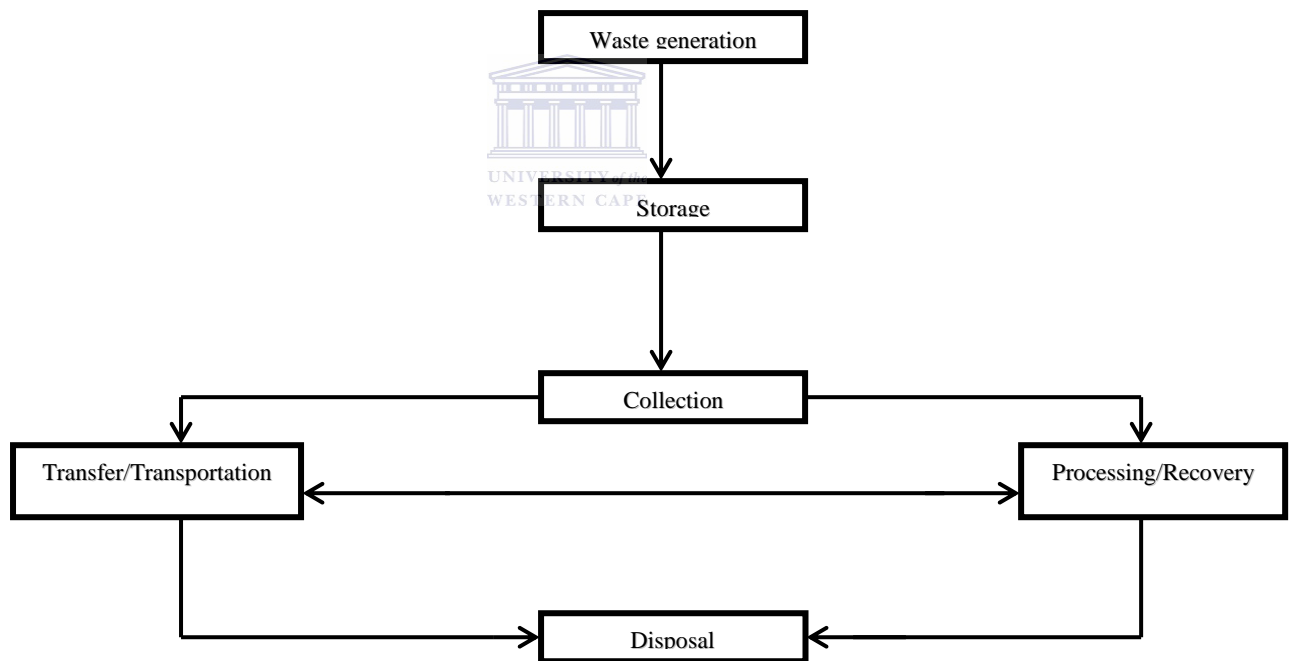
**Chapter 5** presents the results from official sources and census data as a basis for the comparison with the CMA. A combination of survey information gathered by the administration of questionnaires is also put forward. A demographic profile as well as an analysis of waste disposal processes is sketched for the CMA.

**Chapter 6** outlines the conclusions drawn from the study as well as the recommendations made by respondents and the researcher. In order to validate the data collected (2003), statistics sourced from the Provincial Department of Environmental Affairs and Development Planning are utilized.



## CHAPTER 2 LITERATURE REVIEW

Fundamentally, the management of solid waste generally perceived as an urban problem. However, many rural areas still have inadequate waste management practices, posing on-going problems. Therefore, the problem of inadequacies in waste management is identified and viewed as a priority especially in urban areas (Botkin & Keller, 1995). The abovementioned contention is substantiated by Bryant, Russwurm and McLellan (1983), who states that “the countryside is often used as a city garbage dump or rubbish tips, which might be planned or unplanned sites”. In the case of planned sites or sanitary landfill sites there are often negative externalities associated with it, which include visual degradation and odour problems. The disposal and storage of waste is evidently challenging, and measures must be put in place in order for more holistic waste management strategies to be implemented. According to Fuggle and Rabie (1992), waste management processes consist of six functional components, as depicted in Figure 2:



*Figure 2: Waste management processes<sup>2</sup>*

Waste management strategies should entail a holistic approach, encompassing each of the functional components listed above, where waste is dealt with in an environmentally accountable manner from its generation to its eventual disposal.

<sup>2</sup> Source: Fuggle and Rabie (1992)

According to South Africa's Water Research Commission (1996) the stages of waste management includes the following processes:

- Generation
- Storage
- Collection
- Transport
- Recycling
- Reclamation
- Reduction
- Disposal
- Sale of recovered resources.

## **2.1 Waste generation**

In this chapter, focus is placed on the generation and classification of waste, outlining the types of discarded materials and how it is disposed of, the waste management strategies that have been implemented on international and local levels, how they are applied in developed and developing countries, as well as alternative approaches. Various waste disposal methods are also highlighted, which include open dumps, sanitary landfill sites, incineration, exporting waste, animal feeding, composting, recycling and additional means of disposal. These are examined to acquire a sense of what their implications can be and how they will shape the waste management strategies that are in place within the areas investigated. Waste disposal services, which scrutinize the organization, planning and monitoring of waste management are also emphasized.

### **2.1.1 Solid waste generation and its classification**

The waste stream, according to Cunningham and Saigo (1990) can be seen as the steady flow of varied waste that is produced, ranging from domestic and yard waste to industrial, commercial, and construction refuse. According to McKinney and Schock (1998) solid waste includes items such as household refuse as well as various semi-solids, liquids (such as sludge or liquids in solid containers), and gasses (often contained in solid containers, such as gas canisters) that result from mining, agriculture, commercial and industrial activities. As a significant number of these activities are

practiced in the CMA a survey in 1977 found that the total waste generated per capita per day was “0.70 kg with the highest in Camps Bay and parts of Rondebosch (Cape Town) west of the main road (at 1.25kg) and the lowest on the Cape Flats (0.50kg)” (Cape Town, City Council, 1982:463-473). The low level generation of waste on the Cape Flats can be attributed to the low income of all the people residing there. More recent statistics affirm that an average of 1 kg per person per day was generated in the CMA<sup>3</sup>. This could possibly be attributed to the fact that the population consume more packaged goods and consequently generate more waste.

According to documentation provided by the Department of Environmental Affairs and Development Planning, the Western Cape Province generates 8,8 million m<sup>3</sup> of solid waste per annum. The average waste produced in Cape Town alone is 2 cubic metres per person per annum. The high income group “...which is the smallest number of people generates nearly 60% of all solid waste, 30% is generated by the majority who are the middle income groups (including skilled working class households), and only 10% by the very poor” (DEA &DP May, 2005). Similar results were demonstrated in the sample researched in the CMA. The bulk of the respondents (58% of the sample), the prevalent population group, were found to earn R2 000 or more. This is discussed in Chapter 5 (subsection 5.1.4).

In order for waste management strategies to be implemented effectively, the classification of the different types of waste is imperative in determining the source of generation and rate at which it is produced and an efficient means to dispose of the waste.

In the 1970s solid waste was classified into four categories, namely agricultural, industrial, mining and urban (Cape Town (City Council), 1975). This provided a very broad categorisation of waste and with the pace of urbanisation it became more sectoral.

---

<sup>3</sup> (<http://www.cmc.gov.za> - online 17/03/03).

Urban solid waste is classified as follows:

1. *Inert waste* is regarded as not having negative impacts on the environment, unless it is disposed of in an unacceptable or unsustainable/illegal way. This includes builders' rubble, tyres, and cover soil.
2. *General waste* can be harmful when the products of its breakdown may have negative effects, this includes household, commercial, and garden refuse as well as harmless industrial wastes.
3. *Special waste* includes wastes that may cause environmental degradation due to its concentration, quantity, or physical, chemical or infectious characteristics. The treatment, storage and transport of such waste must be well managed prior to final disposal (Fuggle & Rabie, 1992).

The abovementioned types of wastes are the general types produced by people, commerce and industries every day. They end up either being recycled or disposed of at landfill sites that accept household waste and hazardous waste.

Professor F.T.K. Sefe (2000) on his discussions on waste uses the “term controlled waste” in its legal sense and states that it includes “... all waste from any or all .....sources which a regulating authority wishes to control the disposal of. The management of waste falls within the scope of the Environmental Conservation Act of 1989 in which the authorisation and closure of landfill sites in particular is captured.”

## **2.2 Waste Management Strategies**

Fuggle and Rabie (1992) view waste management strategies as being a holistic approach to waste management where waste is dealt with in an environmentally responsible way from its generation to its ultimate disposal.

### **2.2.1 International Examples**

Waste in developed countries of the world is better managed due to superior infrastructure and resources. Developing countries on the other hand have to and want to follow suite but fail due to poorly developed infrastructure and issues relating to the social well-being of their people.

In developed countries such as Denmark the basic aim of waste management is to achieve more recycling in accordance with the trends of policies in the European Community, Nordic countries and the rest of the First World. The national waste priorities of Denmark have been established, and these include avoiding the creation of waste, increasing recycling and reducing the amount of untreated waste dumped at landfills. The latter priority is accomplished by incinerating (with heat recovery) waste that cannot be recycled, and composting or treating waste by other controlled methods (Busch, 1992). In 1998 the lifespan of the White Street Landfill, Greensboro, North Carolina, was extended by introducing a waste diversion initiative by the recycling of construction and demolition waste in a dedicated section. The process of recycling is becoming more important due to landfills reaching capacity and public awareness (Chang & Cramer, 2003).

The fundamental difference between developed and developing countries is that in developed countries the issues of waste are centered around difficulties and high costs attached to the volumes of domestic and commercial waste generated, whereas developing countries face predicaments relating to the minimize the waste collect as well as with the final disposal of waste. In these countries waste remain uncollected and in urban centers of developing countries a mere twenty percent of solid waste is collected (Pacione, 2001). This is aggravated by insufficient funds for the installation of local infrastructure, especially for efficient solid waste management in rural areas such as Guyana (Závodská, 2003). In many instances the vehicles used for waste collection are not suitable for the rough terrain that must be ventured into in rural areas. In developing countries the aforementioned contributes to the insufficient services rendered to communities found in remote areas.

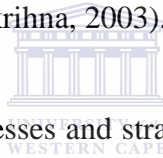
In the past ten years the generation of waste in Argentina's capital (a developing city) has increased by thirty percent. A study done on solid waste generation in Buenos Aires culminated in the first steps to formulate a strategy to improve the manner in which the city deals with two million tons of waste per year. The solid waste system that this country's local authority initiated was aimed at the "... management of waste from generation, to handling, to transportation, to storage and treatment for recovery."<sup>i</sup>

In 1983 a Brazilian municipal engineer designed a small composting and recycling plant where the 450 low-income families could dispose of their waste in a more



environmentally friendly manner. Not only did this provide a centralised system of waste collection, but also employment for numerous unskilled labourers. The handling capacity of the plant was one ton per day. Waste was separated on arrival and the recyclable materials were separated and sold. Most of the remaining material was composted which reduced the volume to a quarter. This design was used to develop other composting plants where municipalities experienced similar circumstances. In the case of Triangulo de Peinxeiros in Olinda, Brazil, it becomes clear that the reduction and recovery of recyclable goods reduces the volume of waste received at landfill sites and or incineration plants. This settlement which consisted of low-income families where no sanitation, refuse services and road networks would inevitably encounter some or other crisis as far as waste management was concerned (Water Research Commission, 1996).

In India the reduction of waste by means of composting of organic waste and recovery/recycling processes are viewed as methods to combat the amount of waste disposed of at landfill sites (Sivramkrihna, 2003).



In view of waste management processes and strategies there are distinctive differences that are highlighted by the Water Research Commission (1996). As far as the storage of waste in developed countries is concerned a standardized storage container, “usually plastic bags or bins”, is used which is collected at fixed frequencies (Water Research Commission, 1996). When waste is taken to the landfill site it is weighed by means of a chip that records the mass, contents and nature of waste brought to the landfill. Countries mentioned in the report are the United States, it had been in operation in Minnesota for more than the three years as well as in East Germany and Australia. These methods are mainly found to be active in developed countries where established infrastructure and well-managed waste management procedures are found.

Non-standardized waste storage types included cardboard boxes, plastic bags, crates and more permanent containers such as plastic or metal bins. Mainly communal storage units are found in developing countries due to the fact that the abovementioned types such as plastic bags tend to be environmentally harmful. The reason provided by the Water Research Commission is that of climatic severity and interference by animals.



The collection of refuse in developed countries occurs when waste is collected on the kerbside of roads in residential areas by means of “motorized compactor vehicles”, where which the frequency of collection is at least once a week (Water Research Commission, 1996). The report makes mention of a town, Abidjan (Ivory Coast), where the principal means is a two- wheeled push cart making its daily rounds for the collection of refuse. As far as developing countries are concerned not all modes of transportation are motorized. In the commercial city of Onitsha, Nigeria, a study was done on the collection of solid waste and it was found that the cost of sufficient waste collection cannot be afforded. In minimizing the costs of waste collection the establishment of transfer stations were investigated and found to be more economically viable over long term (Agunwamba, Egbuniwe & Ogwueleka, 2003). The collection of waste be it by means of motorized or manual means forms a pivotal part of waste management strategies implemented in in developed or developing countries.

### **2.2.2 The South African Situation**

In terms of South African waste management strategies Fuggle and Rabie (1992) elucidated a similar conception and maintained that a database on a national level is important in the development of any waste management strategy. Deductions based on the extent of waste generation can be made, for example, in the evaluation of present industries, if such a database is available. Although databases are available in the CMA, data volumes and inconsistencies make their use questionable. An example of one inconsistency was found when investigating the closure of landfill sites Swartklip, Brackenfell and Blue Downs, which closed but in reality are still in operation.

Waste management strategies should be logical and systematic in order to ensure acceptable means of disposal. The Minister of Environmental Affairs and Forestry stated that the Million Rand Clean City competition is held in reaction to the fact that South Africa “...cannot deal with the mountains of waste that are mushrooming everywhere” (Sylvester, 2001). The article stated that the government would use the National Waste Summit as “...the platform for the development of a national waste strategy....” and proposed spending R35 million on projects that will focus on waste and in turn assist in poverty relief (Sylvester, 2001).

On a provincial level it is apparent that the waste management strategies are executed by the implementation of waste disposal practices, such as sanitary landfills, incineration to a certain extent, composting, and recycling in the Western Cape Province and more specifically the CMA. These practices are reviewed below.

### **2.3 Waste Disposal Methods**

Waste disposal may be viewed as “...land-filling, incineration, deep-well injection... because ‘disposal’ means dispersal into the environment” (Tyler Miller, 1998, p86). Various waste disposal methods are used throughout the world, varying from country to country according to the availability of resources and waste management strategies that are in place. The dissimilarities between developed and developing countries are apparent. The manifold waste disposal methods include open dumps, landfills, exporting waste, incineration, swine feeding, composting and recycling/resource recovery. In order to extend the life span of landfill sites the introduction of recycling, composting and incineration into a waste management strategy is recommended (Chang & Nishat, 2005).



#### **2.3.1 Open Dumps**

Open dumps, are a method of waste disposal which involves simply dropping the waste somewhere (Cunningham & Saigo, 1990). Berry and Horton (1974) view an open dump as an area where refuse is dumped and allowed to remain exposed to the atmosphere. In Denmark, the traditional method of disposal was to dump untreated waste at municipal and private dumps and sanitary landfill sites. The control and regulation at these landfills were not strict as the municipality was responsible for only domestic waste and industries had to dispose of waste in an environmentally sensible way. This caused ground pollution as no special measures were taken to prevent this.

Due to the limited land available in Denmark for the purpose of waste disposal and the increasing generation of waste the problem was exacerbated, with amplified occurrences of water contamination. Environmental damage and pollution brought forth the development of a waste management strategy that is viable and in place in Denmark. Open dumps are deemed an environmentally inadmissible method of disposal, although open, unregulated dumps are still prevalent in many developing countries (Busch, 1992).

### 2.3.2 Sanitary Landfills

Landfill disposal, according to McKinney and Schock (1998), is in the simplest sense a hole in the ground where solid waste is deposited and covered with layers of soil to prevent rodent and vermin infestation as well as odour problems. Due to problems with hygiene around dumpsites and landfills, noxious odours, groundwater contamination and land contamination, the Danes saw the only remedies to be the reduction of waste generated, by means of incineration. The remedy was to build more incineration plants in the early 1970s and to put strict regulations in place where landfills and dumpsites were concerned (Busch, 1992).

According to Berry and Horton (1974), land-filling is characterised by competent and continuing engineering, planning and control. Such landfills do not produce ground and surface water pollution or allow burning of waste. Waste is compacted and covered with six centimeters or more earth cover material. Cunningham and Saigo (1990) describe landfills as a regulated and controlled means of disposal. In earlier days, landfills were the most convenient and inexpensive means of waste disposal, but as the demand for landfill construction and maintenance grew it became more expensive. In general, suitable sites for waste disposal are becoming scarce in many areas. In the case of the CMA, general landfill sites need to be regulated and controlled in accordance with the Minimum Requirements for Disposal by Landfill website<sup>4</sup>. There are 37 closed landfill sites recorded in the CMA. Currently, three of the seven landfill sites operating comply with the Minimum Requirements. According to Barnard (1999) the Minimum Requirements provide the step-by-step procedure for selection, design, operation, closing and monitoring of landfills.

#### *Legislative provisions for the management of waste*

In South Africa provision for the management and monitoring of waste disposal sites is made in two pieces of legislation: the National Environmental Management Act 107 of 1998 (NEMA) and the Environmental Conservation Act 73 of 1989 (ECA). Within in scope of the above Acts the environment must be protected by all individuals which includes the disposal of waste, the selection, design, operation, closure and monitoring of landfill sites.

---

<sup>4</sup> <http://www.cmc.gov.co.za/peh/soe/issues.htm> - online 22/02/2001

Section 28(1) of the NEMA states that every person who has caused or may cause significant degradation of the environment must take reasonable measures to prevent such degradation from occurring, continuing or recurring. This section of NEMA is encapsulated in and in line with the constitution which underlines the importance of the right to a clean and healthy environment. The ECA however enables the management of waste and is included in sections 20 and 24 which regulate monitoring and authorising functions. Section 24 which is an authorising regulation shares this function with the department responsible for water management and the department responsible for environmental management (Barnard, 1999).

No provision in terms of a legislative framework existed, however this was not the case in earlier days, as the only important criteria for endorsed sites was merely available land and good access (Cape Town, Greater City Council, 1982). The scarcity of land for the construction of landfill sites in the CMA is due to the contending land use demands and has subsequent impacts on waste disposal practices<sup>5</sup>. Obtaining suitable sites for landfills as well as the required cooperation between inter-local authorities are deemed problematic as it inevitably creates obstacles for suitable waste disposal practices (Cape Town, Greater City Council, 1982). With the problem of limited land available for new landfill sites the City of Greensboro, North Carolina used their recycling and composting programs to add two years to the landfill site and saved approximately \$18.8 million (Chang & Nishat, 2005).

Tyler Miller (1998) view landfills as preventive measures in terms of reduction in air pollution, odour problems, and are places where rodents and insects cannot be harboured. Citizens in urban areas have become more concerned and vocal about health hazards, as well as aesthetics. For these reasons landfill sites are generally located on remote land away from residential areas. With urban sprawl, development is encroaching where landfill sites are found. There are examples of seven disposal sites in the CMA where urban development was initiated, i.e. in the vicinity of Swartklip, Bellville and Brackenfell landfill sites in Figure 12. The rapid growth of urban areas is another contributing factor together with the development of informal settlements in the

---

<sup>5</sup> <http://www.cmc.gov.co.za/peh/soe/issues.htm> - online 22/02/2001

CMA, making the tasks of waste collection challenging due to difficulties in accessing such areas<sup>6</sup>.

### 2.3.3 Incineration

As there is a lack of available landfill space and an increase in waste generation, city planners investigate other disposal methods. The most frequently used method in urban areas is that of burning wastes as a means of waste reduction. This is known as incineration: piles of waste are burned and in turn the energy that is generated from this is normally used for electricity and for heating purposes (Cunningham & Saigo, 1990). Berry and Horton (1974) describe incineration as being a means of waste reduction where refuse is burned at high temperatures to prevent smoke and odours. Incineration as one of most common waste disposal practices (Botkin & Keller, 1995). Incineration happens when combustible waste is burned at high temperatures to consume all burnable material leaving only ash and non-combustible materials to be disposed of at landfill sites. Incineration is often implemented as a means for waste disposal, particularly in countries such as Japan and Denmark, where land space is limited. In these instances not only medical waste but also domestic waste is incinerated. Although control devices are used in the prevention of dust and fly ash discharge, it will give off smoke and odours if incinerators are overloaded or improperly operated.

According to Denmark's waste management strategy, incineration is viewed as a means to an end in that all waste that cannot be recycled or composted is incinerated. The goal is to minimize waste distributed to landfill sites and to gain from this practice as it stipulates is "...to use as much possible waste heat produced by incineration in district heating" (Busch, 1992, p2). The energy generated by these incinerators is used in the district heating system providing energy to be distributed to homes and businesses.

In some metropolitan areas incinerators are normally operated above their design capacity. In the CMA there are two incinerators in operation that are permitted to incinerate medical waste. A company called Enviroserv operates the one at Vissershok near Milnerton, and a smaller one is situated in Delft. Both incinerators, according to the<sup>7</sup> NWMSDR of 1998 must close down if they do not comply with the standards and

---

<sup>6</sup> <http://www.cmc.gov.za> –online 22/02/2001

<sup>7</sup> National Waste Management Strategy Draft Report of 17 December 1998

regulations by the year 2005. All are operated by privately owned companies and according to statistics provided by the DEA & DP four incineration plants are found in the CMA and only three are operating with permits.

The newest development concerning incineration is in process in the CMA (Sylvester, 2001). A one billion rand project was to commence in April 2002, which is an initiative sponsored by a Bahamas-based company, Kwikpower International. For the next ten years funding will be provided by the aforementioned company that will be liaising with locally owned Solid Waste Technologies. This project involves creating 'green' electricity, fuel and brick-making for low-cost housing. Low-Income areas such as Khayelitsha, Athlone, Langa and adjacent areas will benefit from this venture. This involves the generation of electricity by using garbage, sludge and even old tyres. As location and accessibility to tap into the national grid were important aspects, the Athlone power station has been earmarked to incinerate waste as this disused power station already processes 800 tons of waste daily.



There are advantages as well as disadvantages attached to the abovementioned project. The listed advantages are as follows:

- The bricks will be used for low-cost housing. They can also be used for airport runway surfaces as done in Canada.
- The alcohols produced can be processed into 95-octane unleaded petrol.
- The facilities can be installed at waste disposal sites, thus removing the need to transport waste over long distances.
- This project will provide an income and jobs when plants built in South Africa can be sold to other African countries. Another form of employment will be related to maintenance and the manning of the plant as it will be operational 24 hours a day and 365 days a year.
- The facilities are viewed as a solution to the rising problem of pollution and waste disposal problems in the Southern African region (Cape Argus, 2002).

As the incineration facilities are small enough to be transported by a freight container to rural areas where Eskom cannot produce electricity, it would also provide good quality bricks for low-cost housing (Cape Argus, 2002).

The drawbacks as identified by researchers from the Council for Scientific Industrial Research (CSIR) and as reported by Yeld (2002) were as follows:

- Although recycling ranks low on any waste hierarchy it forms an integral part of waste minimization. Waste prevention, demand management, waste reduction, waste recovery and waste re-use also rank higher than recycling and incineration. Researchers are apprehensive about the way in which the fact that all waste is accepted will promote the mind set of people who cannot practice the abovementioned waste management strategies. This means that products such as plastics, metals, glass, batteries, paint residues, etc. will also be incinerated.
- The main concern of the Cape Metropolitan Waste Management group is waste reduction, promoting the removal of the solid waste problem at source as far as possible. Other issues that they address involve separation for re-use, recycling, etc. before treatment or disposal.
- With the encouragement of incineration the goals that have been set concerning reduction, re-use and recycling will not materialise as all waste will be used to fuel an expensive plant. Thus a large amount of valuable and useful resources such as paper will be lost due to being incinerated.
- They also question the guarantees that have been given by the concerned parties with regard to the level of emission into the environment.
- The production of building material is said to be “technically feasible, but there are certain performance criteria.”
- The only advantage they could procure is the volume reduction at landfill sites, as only ash will be deposited at the sites.

The question should be whether or not we are ready for such technology, since the implementation of waste prevention, reduction, recycling and re-use strategies are not efficient. These strategies should be included in this project to make it environmentally feasible.

### **2.3.4 Exporting waste**

As the costs of disposal and limitations on what can be dumped have increased, many European and American cities and industries choose to send their waste abroad to less developed countries. Local people in developing regions such as Africa, Latin America and the Middle East are oblivious to the waste being dumped on their land (Cunningham & Saigo, 1990). Developing countries often repay debts in this manner and allow this atrocity to occur without the knowledge of their citizens.

According to Vu (1994, p156) transboundary transportation of waste occurs in the event where a “country that lacks safe disposal facilities for the unrecycleable toxic wastes it generates and faces three choices: (1) disposing of the wastes locally (and, by hypothesis, in an unsafe manner); (2) halting waste generation; or (3) shipping the wastes elsewhere, preferably somewhere with safe disposal facilities”. The above is questionable since many countries are not aware of waste entering the country due to the government of that particular country being misinformed as to what is imported or attributable to agreements between land owners. Vu (1994) questions the fact that the exporting of waste, be it hazardous or other is regulated by domestic or international law. On domestic level the regulations and legislation in place would protect the country at the receiving end due to the monitoring functions that are in place. In terms of international regulations the exportation of waste is a bit more intricate due to agreements between the respective countries and the monitoring of compliance with regulations and legislation of these countries.

### **2.3.5 Animal feeding**

Other practices as stated by Berry and Horton (1974) are swine feeding in which organic waste is used to feed animals, more specifically pigs. This sector within waste management was once a very profitable measure of disposal. This however led to the outbreak of diseases that cause high mortality rates among farm animals which resulted in economic losses to agricultural and farming enterprises. In a report published by the Department of Primary Industries and Fisheries in Queensland, Australia, a practice known as swill feeding was banned in due to the possibility of infection of live stock due to this practice<sup>8</sup>. This includes feeding animal and vegetable matter to animals

---

<sup>8</sup> <http://www2.dpi.qld.gov.au/health/3579.html> - online, 20/02/06



which may subsequently lead to the following diseases, detrimental not only to animals but to humans alike. These include Foot and mouth disease; African swine fever; Classical swine fever (hog cholera); Aujeszky's disease; Swine vesicular disease; Newcastle disease in poultry; Vesicular stomatitis; and Transmissible gastroenteritis. Foot and Mouth disease outbreaks in South Africa and the United Kingdom led to Australia's decision to ban this particular means of waste disposal<sup>9</sup>.

In São Carlos, Brazil food residues from residential waste is collected, processed and chemically enhanced. This was found to be fit for chicken feed when combined with other ingredients such as corn bran and soyabean bran. Utilising waste in this way reduces the amount to be landfilled (Viana & Schulz, 2003).

### **2.3.6 Composting**

Composting, another disposal practice, involves the decomposition of organic waste, through bacterial action, into humus-like material. This appears to be a desirable solution as it results in a usable product, being soil conditioners and fertilizers. Size reduction equipment in solid waste management has been extensively used in the last twenty years. Such equipment was utilized to produce material suitable for composting. The implementation of shredders was used in the recovery of ferrous (iron-based) metals from solid waste and for processing of refuse for disposal in landfills (Diaz & Savage, 1994).

In a developed country such as Denmark all organic wastes of all households are taken to the well-established recycling depots from where they are transported to an incinerator, then burned and returned to the recycling depot for public use. This service is provided at no cost to the public. In Cape Town the composting of solid waste takes place at three designated facilities. These plants are located in Bellville and Radnor, managed by the Tygerberg Municipality and at a plant in Mitchell's Plain under management of the Cape Metropolitan Council. It is estimated that 49 000 tons of compost per annum is produced<sup>9</sup>. At the Mitchell's Plain Composting Plant refined compost is for sale to the public at R6,24 per bag (see Figure 10). It becomes clear that

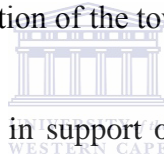
---

<sup>9</sup> [http://www.cmc.gov.za/peh/soe/waste\\_a.htm#](http://www.cmc.gov.za/peh/soe/waste_a.htm#) -online 31/03/2003

if the public is to be involved in this process no money will be attached to the distribution of compost.

### 2.3.7 Recycling and resource recovery

Recycling is the processing of discarded materials into products that can be reused. There are two types of recycling: *primary recycling* which is a process of making materials or products from the original waste, and *secondary recycling* that creates different products which may or may not be recyclable, for example cardboard from waste newspaper (Tyler Miller, 1998). This process is known to be an economic and environmental issue. Economically, recycling is not very viable as little money is gained by the collection of recyclable material by the public. Morrissey (2004) concurs with the views of Tyler Miller but states that waste management systems must be “environmentally effective, economically affordable and socially acceptable”. The issue of social acceptability around waste management systems is that economic and environmental aspects are considered rather than the improvement of “the decision support tool” referring to the population of the town or country.



Waste activists stated that they are in support of incineration and that it surpasses recycling. Reasons provided for their stance include the example of Sweden where “Swedish campaigners say recycling is more expensive than incineration without added environmental benefits” (Cape Argus, 2003). Environmentally, this practice is unsuccessful in many ways, for instance when there is no waste management strategy in place for promoting recycling. Recycling has to become part of people’s daily routine and the only way for it to succeed is to implement policies to enforce this practice. For example, in 1986 in Denmark waste disposal tax was introduced and ever since 1996 citizens of Denmark had to pay tax to the amount of DKr 335 (£30) for landfill and DKr 20 (£19) for incineration with combined heat recovery and power. This has assisted in the management of waste in this country. The Danes are an example of how recycling can be successful; recycling plays a remarkable part in their

Type	Landfill (%)	Recycling (%)	Incineration (%)
Construction and demolition	1	90	9
Commercial	7	41	52
Household	3	19	78

waste management strategies

(Table 1) (Cooper, 1999).

***Table 1: Types and methods of waste disposal in Copenhagen, 1996***

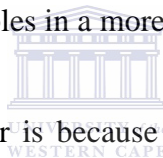
Table 1 show that recycling plays a major role as far as construction and demolition material is concerned. On the other hand it can be seen that most of the household waste in Copenhagen is incinerated which supports the argument of the aforementioned Swedish Waste campaigners.

In England the reform of the UK Landfill Tax Credit Scheme in November 2002 made funding available for the implementation of more effective waste management strategies (Phillips, Morris & Woolridge, 2005). The “Waste-not-Want-not” program is one of the initiatives funded through the credit scheme.

As far as municipal recycling is concerned, there is a great diversity of approaches. Many municipalities in the United States and other developed countries makes the process more convenient for the public by providing residents with containers in which to separate the materials, which are then collected by the municipality. There are certain characteristics of a successful program. These include the initiative taken by the municipality in the form of charges where residents are charged for the collection of general waste and not for the recyclable materials. In some municipalities recycling is not optional. The materials are collected curbside and recycling bins are provided. The goals of recycling are made clear and local industries also have to make an effort to be involved (Nebel & Wright, 1996). The collection according to Everett (2003) is an expensive exercise also because the amount of waste collected is less compared to the total waste stream. The population views the separation of household waste as a time-consuming and additional activity. In Dar es Salaam, Tanzania households were provided with storage bags of different colours for the purpose of separation of waste at household level. The study showed that if households are provided with the necessary storage bags, the process of re-sorting and storage is less complicated (Mbuligwe, Kaseva & Kassenga, 2003).

In developed countries these activities are more formalized. These countries experience cooperation from the general public due to laws implemented. “The responsibility for this generally falls upon the authorities” (Water Research Commission, 1996).

Recycling in developing countries is a more complex process as it is characterized by the scale of the complexity of “...waste minimization, recovery of materials from wastes for re-use or recycling and the use of minimal resources” (Water Research Commission, 1996, p52). It was also mentioned that these re-usable materials are often used by people who fall into the low-income bracket in the construction of shelters. In Mexico City approximately ten thousand people informally forage at landfill sites. Even though these people minimize the amount of waste disposed of at landfill sites, authorities see them as pests and attempt to alleviate the problem because of the associated health risks that people are exposed to (Water Research Commission, 1996). This concern is due to the health risks associated with searching through waste on landfill sites. Best practice in this case would be to review the unemployment rates and attempt to create jobs using recyclables in a more formalised way.



The reason recycling is not popular is because it exceeds the cost of combustion or placing it in landfills (Nebel & Wright, 1996). This argument is supported by the statement where campaigners view recycling as unfeasible in view of the fact that waste that cannot be recycled in Copenhagen is incinerated. For this reason the CMA recycling program is not particularly successful. Only 11 per cent of South African adults recycle materials such as glass, plastics and vegetable waste (Cape Argus, 2002). The total amount of glass recycled is approximated at 15 500 tons per annum, metal at 300 000 tons per annum and paper at 16 000 tons per annum<sup>10</sup>.

Consistent with the statistical sources from the DEA&DP (2005) “...nearly 60% of the industrial waste stream is recycled, while only about 5% of the residential/commercial waste stream is recycled. This corresponds with the data collected where residents argued that they do not separate their waste due to lack of containers provided by the municipality. Notwithstanding this alarming statistic, “...20% of the 700 waste recyclers in South Africa are in the Western Cape, with a 62% increase in the number

---

<sup>10</sup> <http://www.cmc.gov.za/peh/soe/waste> -online 31/03/2003

of recycling operations in the period 1999-2003...” Recycling is seen as a “...market response to the increasing cost of disposal and a noteworthy job creator” (DEA&DP, 2005).

### **2.3.8 Other methods of waste disposal**

On-site disposal of waste refers to the volume reduction of refuse that has been domestically generated. Tyler Miller (1998) mentions two methods:

1. Home incineration where refuse are burned by gas fired or electrically heated combustion chambers under controlled conditions within a building.
2. Garbage grinders – with this mechanism refuse can be processed by grinding it and flushing it through sewers to sewage treatment plants for disposal. Most domestic grinders are permanently installed in drains of kitchen sinks. The “Terminator” promoted by the Verimark company is an example of such a device.



It is comprehensible that the above mentioned waste disposal methods will lead to volume reduction, however in the South African situation the method might not be viable as the socio-economic circumstances of many communities do not permit them the luxury of installing such devices in their homes.

## **2.4 Waste disposal services**

The basic purpose of services concerning solid waste is to provide the “...organisation, planning and control of an effective solid waste cleansing service to achieve a clean and healthy environment” (Cape Town City Engineers Department, 1982). According to the document the then Cape City Council (CCC) was responsible for servicing 151 000 households including commercial sites twice a week.

The services rendered in municipal areas were planned and practised according to objectives of waste collection and waste management organisation. These objectives were expressed as being the following:

- To minimize the amount of solid waste generated per unit time;
- To minimize the cost and maximize the effectiveness of collection, treatment and disposal of solid waste;
- To maximize the percentage of solid waste that could and was separated and re-used in an economically justifiable manner; and
- To minimize the negative impacts of solid waste disposal on all environmental systems. (Cape Town,1982).

The objectives listed are pivotal in waste management. Since all tax- and rate- paying citizens have the right to services, it is the responsibility of local authorities to render these. In the document there are criteria that are used to determine the degree of efficiency of services offered to citizens. They are as follows:

- The frequency of collection;
- The types of waste removed;
- The location from which waste is collected; as well as
- The general satisfaction of consumers.



A two-year study done by Municipal Services Project concluded that “...area still determines the level of services delivered by the council” (Du Plessis & Gophe, 2002,p3). The study reveals that areas like Durbanville, a middle-income suburb, receive about ten times more services than an underdeveloped area like Khayelitsha. There are factors such as unemployment that affect payment for services while overcrowding and lack of accessibility in an area such as Khayelitsha also influence service provision. Khayelitsha is divided into two sections with the eastern part serviced by the municipality and the other serviced by a private contractor. The eastern half of this suburb where refuse is collected by the council is cleaner than the western part which is more crowded and inaccessible to big refuse removal trucks. In Khayelitsha, waste is collected once a week, a frequency identical to Durbanville where the population is smaller.

It can therefore be concluded that payment for services is important. According to Sindane, the Public Partnership Case Study done in Khayelitsha reveals that the levels

of payment are low and it can be attributed to the low levels of income. The study also showed that the level of dissatisfaction was caused by the standard of housing and refuse removal (Sindane, Undated). It is also clear that accessibility into areas influence services delivery. As seen in the case of Khayelitsha the western half receives less adequate services, as it is an area where informal settlements are found (Du Plessis & Gophe, 2002).

## **2.5 Conclusion**

It is evident that there are varied waste disposal practices that can be implemented. Although South Africa has waste management strategies they are not always successfully implemented. If policies and waste management plans are reviewed on national level as well as local level the functioning of these strategies could be more successful. There is still a long way to go before the management of waste requirements will be met satisfactorily in the CMA.

According to Du Plessis and Gophe (2002) waste disposal practices in the CMA are implemented to a certain extent. However, it is apparent there are still unfavourable conditions that prevail in underdeveloped residential areas of the CMA when compared to more developed areas.

## **CHAPTER 3 METHODOLOGY**

### **3.1 Research Methodology**

In order to draw comparisons, relevant authorities in the Breede River District (BRD) and the Cape Metropolitan Area (CMA) dealing with solid waste management were asked to assist in providing information relevant to the study.

The perceptions from residents were also obtained by conducting questionnaire surveys in the former District Councils of the towns of Worcester and Robertson. Observations and recordings were undertaken to get an idea of the current waste disposal practices in the BRD as well as in the CMA. Another purpose of the observations was to record refuse collection and the frequencies at which it occur in order to derive comparisons.

A total of fifty questionnaires were administered in the BRD. The sample size was fifty, twenty-five in each of Worcester and Robertson. The samples were taken to provide for probability of comparison of the solid waste practices and management within these towns. The samples were distributed across different housing types, i.e. privately owned houses (predominantly white population), municipal houses (Coloured and Black communities), municipal built flats, and an informal settlement. Equivalently, areas such as Manenberg, Hanover Park, Khayelitsha, Nyanga, Muizenberg, Pinelands in the CMA were investigated using the same strategy mentioned above.

The questionnaire consisted of questions about the respondents' demographic profile in order to draw analogies with regard to the abovementioned racial components. Direct and indirect questions were asked to permit respondents to state their general opinion concerning waste disposal practices and offer the freedom to respond as adequately as they could. Open-ended questions provided the respondent the liberty to articulate their answers, also allowing them to answer the questions as briefly or extensively as they wished.

### **3.2 Motivation for methods used**

The aim of this chapter is to outline the methods used in gathering information in order to investigate the solid waste management practices in the two study areas i.e. CMA and the BRD. The use of informal discussions, questionnaire surveys and observations,



enabled the researcher to formulate the recommendations from this research. Recent statistics sourced from the Department of Environmental Affairs and Development Planning helped to validate the data collected in the field and elsewhere.

### **3.3 Description of instruments used**

More than one method was employed to examine the differences between the two regions under study with respect to the waste disposal practices and the management thereof. Organisational surveys (targeting municipalities), interviews and questionnaires were utilized to extract information from respondents. In the BRD, the Wineland District and the Witzenberg Region, the municipalities in the towns of Worcester, Rawsonville, De Doorns, Montagu, Ashton, Robertson, Bonnievale and McGregor were approached for information. Four municipalities responded via post to the request for information on the waste disposal practices and management.

#### **3.3.1 Survey for Organisations**

An organisational survey was done by means of requesting information from the relevant Municipalities by mail distribution and faxing letters (see Addendum 1). Mail distribution and fax were used to expand area coverage of the survey. Although this was an inexpensive alternative it added to time and cost in the collection of the data, as response rates were low. Interviews via the telephone were also conducted with officials, as it was a faster means of attaining information even though it had its limitations, being costly and inconvenient at times. Informal structured interviews were used to obtain information on the waste disposal practices in municipal areas.

#### **3.3.2 Interviews**

Interviews were conducted with one hundred respondents as part of the questionnaire survey. The response rate was higher than in the case of mail distribution. Significantly, face-to-face respondents consented to answering a questionnaire with more than twenty questions.

With interviews steered by questionnaire (see Addendum 2) a survey was conducted in two towns in the BRD (Worcester and Robertson) that are categorized as the commercial centres in the districts. This method was employed in order to acquire information on how the populace of these towns perceives the waste disposal practices

in relation to the services rendered by the municipalities. The researcher opted for a sample of one hundred questionnaires. A sample of fifty questionnaires was administered in the towns of Worcester and Robertson collectively. The questionnaire contained open-ended questions allowing the respondent to reply freely, and also contained fixed-scope questions requesting more constrained responses. Knowledge questions were included in the questionnaire as there was need to gather information on a specific topic (Neuman, 2000). In the CMA fifty questionnaires were administered in the study areas. This provided the researcher with the information in order to draw comparisons between the two areas in study. Furthermore the Solid Waste Management Department in the CMA was contacted for information that was faxed to the researcher. In order to verify the data that was collected the researcher relied on statistics from the DEA & DP.

### **3.3.3 Observations**

Permission was obtained to photograph landfill sites. For ethical reasons permission had to be granted by officials from the relevant municipalities since trespassing onto property is an offence. Observations and recordings were performed so as to assess the existing waste disposal practices in the BRD as well as the CMA. The locations of the landfill sites were also significant in the sense of drawing comparisons as to their distance in relation to the location from the source of waste generation. Conditions at the landfill sites were documented photographically. Another purpose of observation was to witness refuse collection and the frequency at which it occurred.

### **3.3.4 Secondary Data**

Due to the comparative nature of the survey and the size of the area covered secondary data were collected in order to make comparisons and validate information. It was found that the CMA was bigger in population size and would thus not be representative of the sample initially selected. Therefore 2001 census data and other secondary sources were used to supplement the data acquired from the fieldwork done.

## **3.4 SITE DESCRIPTION**

### **3.4.1 Breede River District**

The BRD was chosen in view of the fact that it is largely rural. The aim was to compare the waste disposal practices of an urban area in order to provide a clearer understanding

of the similarities and differences in waste disposal practices and the management thereof. The BRD was chosen due to its accessibility and because it presented a real combination of rural as well as urban characteristics.

The BRD is located in the Western Cape Province and consists of towns in the Matroosberg Region and Winelands Region (Figure 3): towns in the sub-district within the Winelands Region are Robertson, Montagu, Ashton, McGregor and Bonnievale.

In the Matroosberg Region the principal urban settlements are Worcester, De Doorns, Touwsriver and Rawsonville. The economy of the region is largely reliant on agriculture and tourism as well as industrial activities found in various towns. The factors that contribute to the tourism industry in the region are the rich history of the region itself, accommodation services, and trade. The farming activities include the cultivation of fruit and vegetables. These products are packaged and exported internationally or sold on local markets (Breede River District Municipality, 1999).



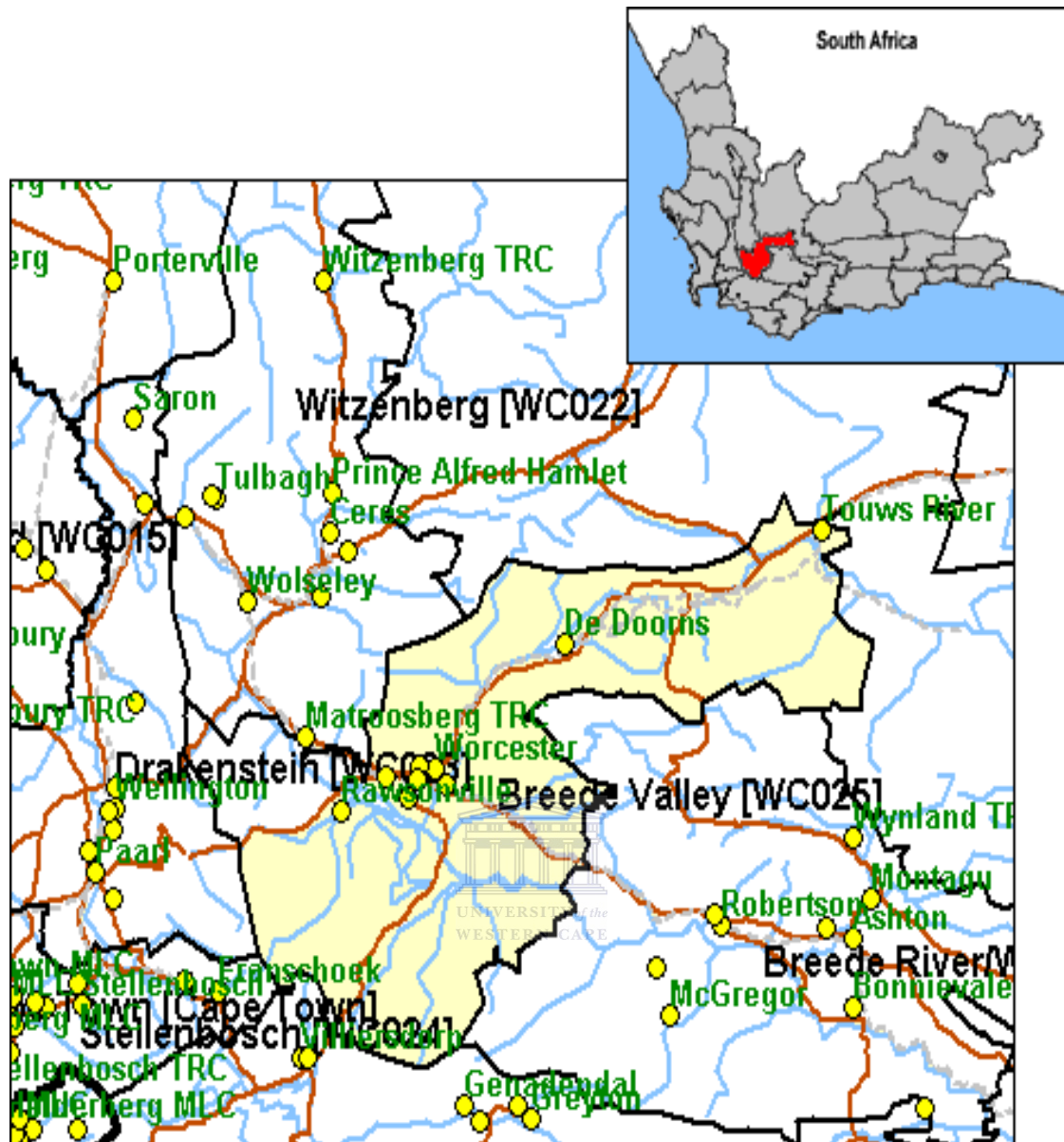


Figure 3: Former Breede River District Council

Source: Internet<sup>11</sup>

<sup>11</sup> [http://www.capegateway.gov.za/eng/your\\_gov/-online-14/11/06](http://www.capegateway.gov.za/eng/your_gov/-online-14/11/06)

### 3.4.2 Cape Metropolitan Area

The CMA is an urban area and was made up of six substructures and municipal authorities (according to the previous municipal demarcations). These are Cape Town, the South Peninsula, and the Oostenberg, Blaauwberg and Helderberg municipalities (see Figure 4).

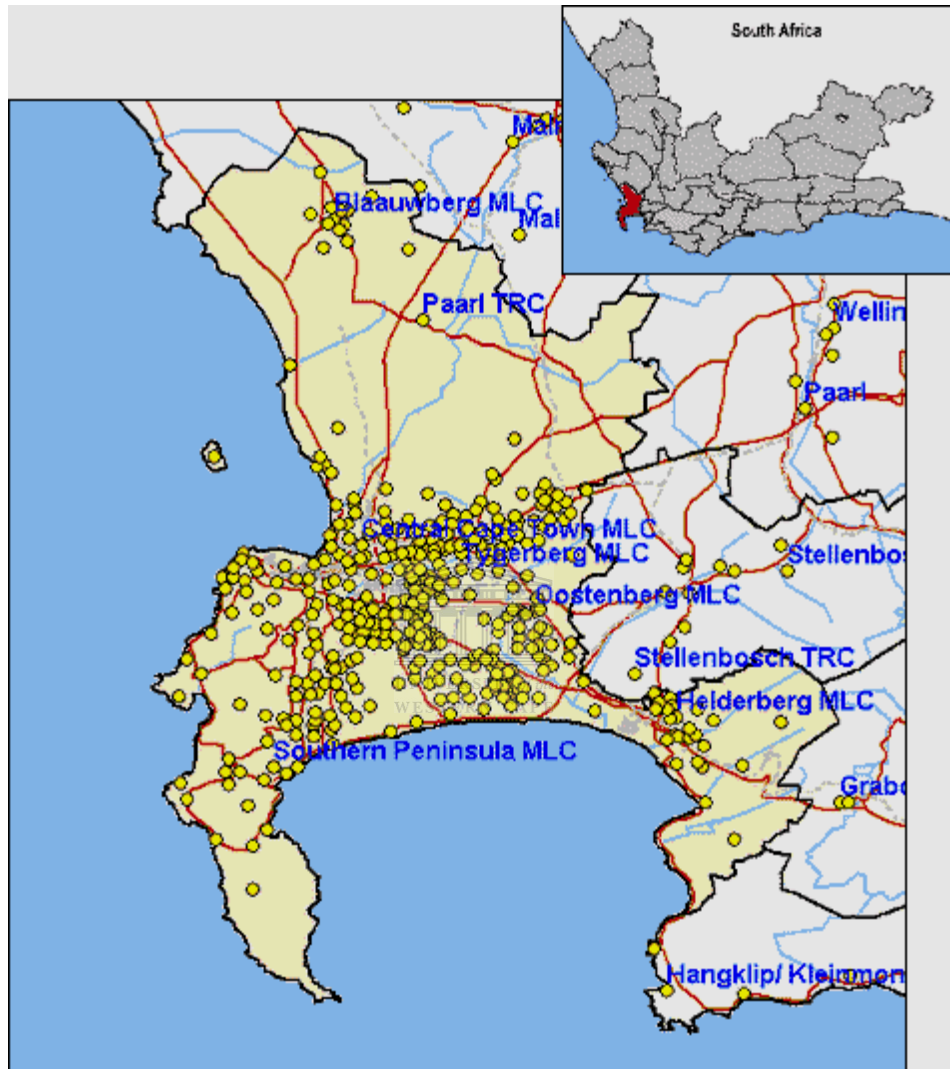


Figure 4: Cape Metropolitan Area

Source: Internet<sup>12</sup>

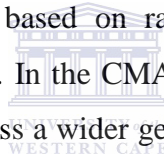
In the CMA mainly commercial, industrial and tourism activities are found. The Helderberg and Oostenberg substructures form the urban edge towards the east of the CMA and the coastline towards the south and west borders the latter. The CMA is the only metropolitan urban area in the Western Cape Province (Figure 5).

<sup>12</sup> [http://www.capegateway.gov.za/eng/your\\_gov/-online-14/11/06](http://www.capegateway.gov.za/eng/your_gov/-online-14/11/06)

### 3.5 Sampling Procedures

*Purposive sampling* (where a sample is collected on the basis of the researcher's judgment and purpose of the study) was used in the case of the municipalities. The researcher regarded this sampling procedure as representative of the sample taken in the CMA. However, of the nine municipalities approached only five provided information.

Also a combination of simple random sampling and stratified sampling was used. Simple random sampling was utilised as it provided the researcher with equal opportunity to select the population. The researcher had to administer questionnaires to respondents that would avail themselves to complete the questionnaire. *Stratified sampling* was employed to provide the researcher with data on the different racial and income groups in the areas investigated. To accomplish the aforementioned the questionnaires were administered in four areas in Worcester i.e. Zwelethemba (black population), Drie Bruggies (informal settlement), Riverview (coloured population), and Bo-Dorp (white population) to offer a diverse result. Fifty questionnaires were distributed in Robertson in areas based on racial diversity to offer similar result intended for the town of Worcester. In the CMA the same method was employed and questionnaires were distributed across a wider geographical area such as the Cape Flats and the Southern suburbs.





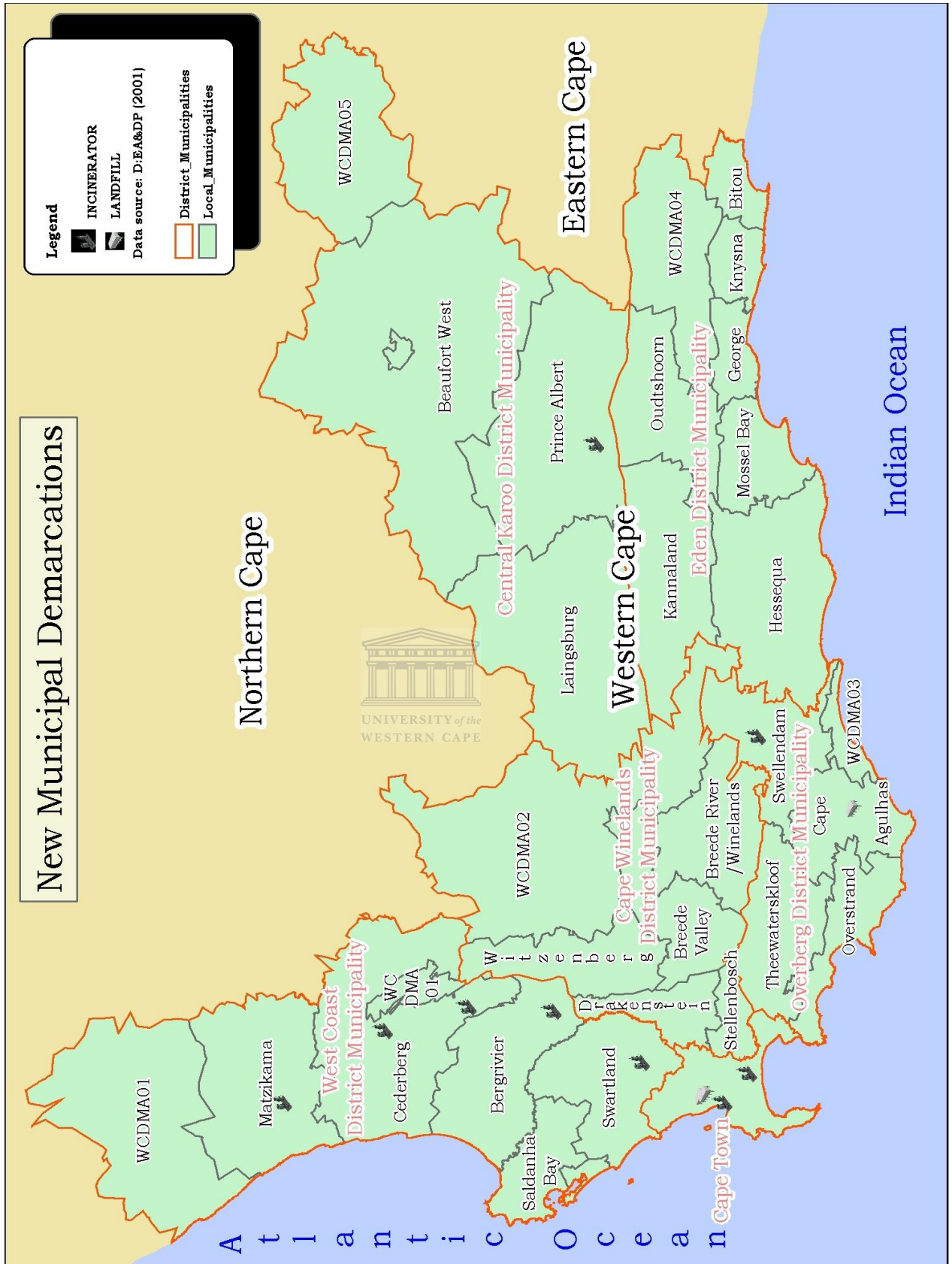


Figure 5: New Municipal Demarcation for the City of Cape Town and the Breede River District

### **3.6 Research limitations**

The research confronted occasional limitations including structural limitations. The occasional limitations included the distance of the BRD from Cape Town where the researcher is based. This was aggravated by the fact that the researcher had to make use of public transportation (taxi) and remain in the area for a period of time. There were also financial repercussions that arose as accommodation expenses were added to the traveling costs.

The researcher was confronted with bridging the language barrier and the location of the identified areas within the study area. It was necessary to appoint a research assistant to administer questionnaires amongst the Xhosa speaking population. The research assistant was a student from the area recommended to the researcher by the IDP manager in Worcester. The assistant was briefed about the topic as well as purpose of the research before the questionnaires were administered. The questionnaires were checked upon receipt to determine whether all sections were completed. The consistency in the answers provided by respondents was generally adequate.



Trips were taken to Worcester and Robertson in order for the researcher to familiarize herself with the area as well as for networking purposes. There were unfamiliar locations that the researcher had to visit and being female alone in an unknown environment was dangerous. The researcher had to trust her instinct to overcome the restrictions of risky situations and the feeling of the unknown.

Another limitation was that due to finding and time restrictions the number of areas that could potentially be visited formed too small a sample set for generalization.



## **CHAPTER 4 DATA ANALYSIS**

### **4.1 Results: Presentation and Discussion - Worcester and Robertson**

Keeping in mind solid waste management and the processes followed, the empirical data as well as secondary data from official sources are now discussed. The main objective is to compare the waste management processes and how they are implemented in both the BRD and the CMA. The waste management strategies are also examined bearing in mind that the success thereof relies on the effectiveness of its functioning. This chapter includes a description of the population groups in the study areas using housing types as a gauge. Waste generation is viewed in terms of the types of waste generated, waste storage container used, and waste processes.

### **4.2 Demographic Description**

The towns of Worcester and Robertson, investigated in the BRD, are rural towns. However, many urban characteristics were found to be established in the form of the commercial and industrial developments in the towns of Worcester and Robertson. It was ascertained that towns such as Worcester are unique due to the economic activities and structure potential.



In view of the fact that this study concentrates on all housing types it was found that the structural variation in the housing types could be categorized as follows:

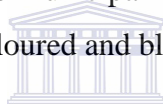
- privately owned homes (suburban areas);
- municipal housing types (rented from the municipality);
- municipal-built flats (blocks of three storey flats built to accommodate a large number of residents); and
- informal settlements (informal homes built on municipal land).

<b>Types of houses</b>	<b>Number</b>
Privately owned houses	14
Municipal houses (Coloured population)	14
Municipal houses (Black population)	14
Municipal-built flats (Coloured population)	4
Informal settlement (Mixed <sup>13</sup> )	4
<b>Total</b>	<b>50</b>

*Table 2: Distribution of housing types in the sampled areas in the BRD*

The towns of Worcester and Robertson in the BRD have a predominantly coloured population. Similar to the selected sample size, the coloured population group is the majority in the towns of Worcester (74%) and Robertson (72.5%) (Table 2). The representative population group in Zwelethemba (98.5%) and Nkqubela (87.8%) is principally African (South Africa (Republic): Census 2001). Census 2001 data were used in order to establish the distribution of racial groups in the above-mentioned areas.

The housing types and distribution are similar to that of CMA as mostly whites resided in privately owned houses, whereas municipal houses, flats and informal settlements were predominantly inhabited by coloured and black communities.

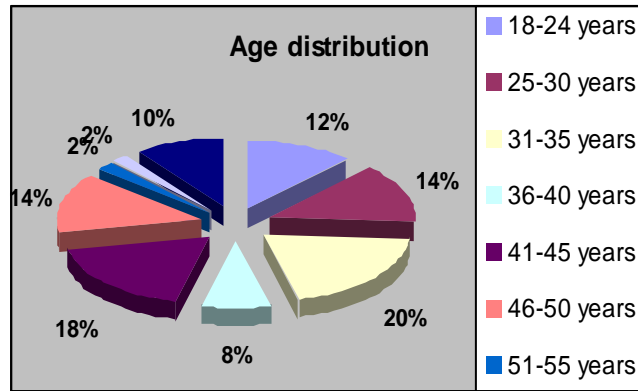


Females represented the majority in the sampled areas. In the towns of Worcester women accounted for 51.7 % and in Robertson 52 %. From the gender distribution the assumption can be made that more males head the households and are the breadwinners. Therefore, they were not found at home during the times the questionnaires were administered.

The age distribution in the sample area was mainly between the ages of 18-50 years, of which the category between 31-35 years (20%) were most represented. It should be noted that the above-mentioned age groups do not depict the economically active section of the population as far as employment is concerned in the towns of Worcester and Robertson. Earning an income permits people to purchase produce with packaging that in many cases is recyclable and that the consumer can dispose of.

---

<sup>13</sup> Both Coloured and Black Population groups reside here.



**Figure 6: Age distribution in the BRD**

More than half of the sample was married (66%) which suggests that two or more people will occupy a home. It is a reasonable assumption that two or more individuals will be responsible for the creation of more waste than single person households.

Home occupancy depends in part on house size, and according to the houses in the sampled area variations were noticed in the number of rooms per house. Certain homes had only one room and others more than five and thus the number of individuals found in one dwelling varied. However it was found that more individuals occupied one or two bedroom homes than those residing in bigger homes. This can also be because of the socio-economic situation this population find themselves in. Most dwellings housed five people (60%). No specifications were made in the questionnaire for the number of children per household, resulting in total numbers provided and not individual totals for adults and children (Table 3).

	<b>Frequency</b>	<b>Percentage</b>
1 person	1	2%
2 people	5	10%
3 people	1	2%
4 people	13	26%
5 people	15	30%
6 people	7	14%
7 people	4	8%
8 people	1	2%
9 people	3	6%
<b>Total</b>	<b>50</b>	<b>100%</b>

**Table 3: Number of dependents per household in BRD sample**

The income of the various population groups did not necessarily reveal employment. It is apparent that the bulk of respondents (46%) earned R2 000 or more per month. The

rest received earnings less than R2 000 (54%) which included categories for no income and pensioners. Notwithstanding the fact that Worcester and Robertson are rural towns most of the respondents were employed in spite of the few that received no income and were pensioners.

The educational levels of interviewees varied. A large number of respondents achieved secondary education, matric passes and higher education, which contributed to most questions being answered more comprehensively. The fact that respondents did not reply did not give any indication of illiteracy or low standards passed. The education level in this area is high taking into consideration that most respondents (88%) had some secondary education and higher (Table 4).

	<b>Number</b>	<b>Percentage</b>
Primary Education Standard 1-5	3	6%
Secondary Education Standard 6-9	15	30%
Matric	20	40%
Higher Education	9	18%
No Response	3	6%
<b>Total</b>	<b>50</b>	<b>100%</b>

*Table 4: Educational qualifications*

The duration of residence is also diverse (Table 5). Most respondents have been living in the town for more than four years which leaves them better equipped to understand their surroundings and how service delivery has improved or not. That arguably puts them in a position to be able to detect changes to waste disposal practices and management in their areas.

	<b>No. of years</b>	<b>Percentage</b>
1 month-4 years	17	34%
5-10 years	11	22%
11-14 years	6	12%
15-20 years	7	14%
21-25 years	2	4%
26-30 years	2	4%
31 years and longer	5	10%
<b>Total</b>	<b>50</b>	<b>100%</b>

*Table 5: Duration of residence*

### **4.3 Waste disposal issues**

This section will discuss the variety of waste disposal practices employed in the towns of Worcester and Robertson.

#### **4.3.1 Areas serviced by the respective Municipalities**

The areas that are serviced by the municipalities vary from town to town. In the town of Robertson it would be the former Robertson Municipal Area. Worcester and Robertson except Rawsonville had a landfill site. Rawsonville's waste is collected and disposed of in Worcester. At the time that research was conducted (2002) the Robertson landfill was facing closure and this town's waste was transported to Ashton's landfill. The site is used as a composting site.

This study concentrated on municipal solid waste generated on domestic level. The 6 processes of waste disposal (Figure 2) demonstrate that these processes are intertwined. Littering and illegal dumping results if these processes are disrupted or absent.



#### **4.3.2 Volumes handled**

In Robertson 650 m<sup>3</sup> of waste is handled per month (excluding garden refuse). The Worcester municipality calculated volumes per erven serviced by the municipality, as the statistics per cubic meter were not available. In the town of Worcester (base town) the data were as follows: 14 500 erven, in Rawsonville 450 erven, in De Doorns 1 700 and in Touwsriver 1 600 erven were serviced.

#### **4.3.3 General monitoring**

According to official documentation (obtained from Robertson Municipality) an Environmental Health Officer in Robertson and Worcester does daily monitoring of the waste disposal facility. The people responsible for this task are at the head of the waste section in the municipality.

#### **4.3.4 Municipal regulations**

According to official information from Robertson there are no regulations governing waste management. It was also noted that the documentation received from the Worcester Municipality omitted this data.

### 4.3.5 Hygiene/standards

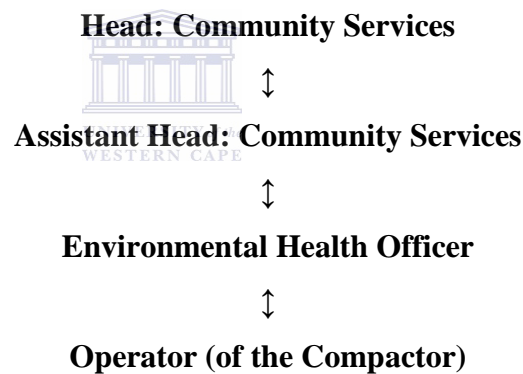
The hygiene status of the Robertson landfill site was described as average in official documentation obtained from Robertson Municipality.

### 4.3.6 Future developments

The municipality in Robertson was in the consulting phase with consultants from three companies responsible for doing the Environmental Impact Assessment to identify and develop a new site for the towns of Ashton, Montagu, Bonnievale, Robertson and McGregor. At the stage of my survey in 2002 the process was in the scoping phase for a site for the town of Robertson. The facility at Worcester is said to have a capacity that can last for the next fifty years.

### 4.3.7 Municipal Waste Management Issues

In Robertson the profile of the department is as below:



*Figure 7: Profile of sections in Municipal department responsible for waste disposal*

In this hierarchy the Environmental Health Officer is responsible for two refuse truck drivers, two refuse tractor drivers, twenty-three general workers, one site worker and seven street sweepers. In the town of Robertson the profile of the waste disposal section fits into that of the Town Engineer's Department. This can be seen in the organogram in Figure 7.

## 4.4 Waste generation

### 4.4.1 Average waste generation statistics

According to official responses Robertson generates an average 928 m<sup>3</sup> of waste per month. Statistics per ton for the year 2000 were reported by town of Worcester.

<b>Category</b>	<b>Robertson</b>	<b>Worcester</b>
Domestic	417 m <sup>3</sup>	851.5tons
Business and industrial	233 m <sup>3</sup>	64.8 tons
Garden refuse	278 m <sup>3</sup>	6.7 tons

**Table 6: Average waste generated per month**

*Source: Municipal data 2000*

#### **4.4.2 Source (s)/ generation of waste**

The municipalities in the two towns classified waste according to the source of generation. In the town of Robertson households, businesses and industries mainly generate waste. In the town of Worcester domestic waste is classified as normal household waste. There is also special refuse such as garden refuse and other lightweight refuse that is collected on request. Cafes, restaurants, fishmongers generate perishable refuse. Industrial waste consisted of large volume generation and may include just about anything other than medical, perishable waste and building rubble.

With the focus on solid waste it was found that with people purchasing disposable goods on a daily basis waste is generated on domestic level. Households in all areas generated mixed waste, ranging from garden refuse, kitchen waste, reading material, tins, plastic, glass, paper, bottles, and nappies. Some respondents described it as indoor and outdoor waste and did not provide any specification or reason.

### **4.5 Storage**

#### **4.5.1 Capacities of containers**

In the town of Robertson the black bag system is utilized, each dwelling is issued with one black refuse bag per week. Storage containers for businesses vary from black bags to 210-litre drums. In Worcester, household refuse is stored in black plastic bags that fit into a standard household refuse bin. A bag can hold seven to ten kilograms of refuse. These bags are collected weekly and placed into a single axle refuse compactor truck that can carry approximately 6 tonnes of refuse. The town of Worcester has two of these trucks in operation. Special refuse trucks carry about 1.5 tonnes of waste. The skips (Wasteman containers) carry about one tonne.

#### 4.5.2 Type of container used on domestic level

Storage containers in the BRD varied from black bins to black plastic bags (bought by owner and distributed by municipality) and oil drums. The most used storage container was the black bag (Table 7). Each household receives twenty-five bags from the municipality on a quarterly basis (every three months). Residents commented that these do not last for the three months and the quality is poor. When the bags are left at the kerb side there is no guarantee that they will not be ripped open by dogs. The same with the absence of waste separation at household level as most respondents could not practice it at home due to the number of bags supplied by the municipality. Mixed waste is stored and consequently attracts dogs.

Categories	Number	Percentage
Black bags	37	74%
Black bags & bins	6	12%
Own black bags	2	4%
Oil drum	2	4%
Wasteman Container/Skip	1	2%
Black bins	2	4%
<b>Total</b>	<b>50</b>	<b>100%</b>

*Table 7: Type of temporal domestic storage container inhabitants use in the BRD*

Black bags are kept on the property to store waste and to avoid unpleasant odours and fly infestations. These black bags are stored in the home and are taken out on collection days. Some respondents mentioned that they bought their own black bags. These are essentially the residents living in the flats in Worcester that make use of the communal bins situated in front of the flats.

Due to the characteristics of the container (Plate 1) it services between four and six blocks of flats amounting to between ninety-two and one hundred and forty four households. According to some of the residents the Worcester municipality once daily collects the waste in these containers. One of these containers can hold volumes of up to one tonne and adding to these volumes is garden refuse that is also discarded in it.





***Plate 1: Proximity of skip to flats***

Residents complained about the proximity of the container to the flats especially during summer months as it poses health risks to residents. Fly infestation and related concerns were raised. Another matter of concern was that the skip was found on only one side of the flats reducing the regularity of discarding refuse. This impacts on the frequency of disposal of waste since individuals would not necessarily walk the distance to discard of their waste. Waste is thus kept in plastic bags either inside the home or outside and is discarded once enough is accumulated.



***Plate 2: Oil drum storage container***

Respondents residing in the informal settlement in Worcester used oil drums amongst other storage containers. The reason is that the municipality did not service this

informal settlement. When waste accumulated it was dumped across the road from the area. Rate paying dwellers are amongst those who receive black bags and for this reason residents in the informal settlement did not receive black bags.

A unique feature manifested itself in Robertson where a masonry structure (Plate 3) was found on the corner of each road for the disposal of garden refuse although it is often used to discard of household waste. Skips also service households and are found on the corners of roads (Plate 4). This means of storage is convenient for many people especially due to the fact that bags are used to store household waste. These containers were located within walking distance of homes and were used not only for the garden refuse that they are meant for, but to discard household waste as well. The disadvantage of these containers being situated on the corners in residential areas pose health risks such as possible infestation of rodents and flies.



*Plate 3: Trailer - tractor system used to transport garden refuse*



*Plate 4: Skips on corner of road*

## **4.6 Collection**

### **4.6.1 Frequency and days of collection**

Formal areas in Robertson are serviced once per week and informal areas twice per week. It can be concluded that the reason for this might be that formal areas have structured waste disposal practices and in informal areas it must still be put into place. In business, collection varied from daily, three times a week to once a week. In Worcester removal is done once a week in residential areas, perishable waste is collected in accordance to volumes generated and can vary from once to five times a week. Industrial refuse that is stored in yellow bins is removed on request.

Refuse collection in the BRD occurred once a week on average in formal housing schemes. The Robertson municipality distinguishes between formal and informal areas that are serviced once and twice per week respectively. In this town it was found that no informal settlements are established as they were substituted with Reconstruction and Development Programme (RDP) housing schemes. The most prevalent frequency of collection is thus twice per week. It can thus be gathered that uncertainty was felt, as far as knowledge about the classification of informal and formal areas, on the part of residents. Residents viewed the RDP housing schemes as informal housing areas.

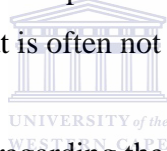
Findings showed that the frequency of collection of waste in the BRD was once a week for 60% of respondents (Table 8). Waste removal was observed twice a week (32%),

while those residing in informal settlement and flats experienced collection once a month, and 2% everyday.

	<b>Frequency</b>	<b>Percentage</b>
Once a week	30	60%
Twice a week	16	32%
Every day	1	2%
Once a month	2	4%
No Response	1	2%
<b>Total</b>	<b>50</b>	<b>100%</b>

*Table 8: Frequency of waste collection in the BRD*

In Worcester the frequency of collection was once a week with the exception of those residing in flats and the informal settlements. Data provided by the municipality made no mention of servicing these types of housing areas, which is in some unofficial manner serviced. Responses were that the containers at the municipal-built flats are emptied everyday and some replied twice per week. At formal houses there is kerbside collection. A number of respondents complained that when waste is collected late, dogs rip the bags open causing a mess that is often not cleaned up.



Overall satisfaction was mentioned regarding the frequency of collection in both towns. It was sufficient for the majority of respondents in the BRD in view of the consistency of collection.

Those residing in the informal settlement disposed of waste opposite the road when it was not ready for collection or was too much to be stored.

People dump waste due to collection that happens infrequently. As a result of this, waste is discarded in close proximity to the home (Plate 5). Despite the fact that this is the cause of poor aesthetics and potential health hazards, this is a means of waste disposal that is practiced. Ultimately this problem becomes and remains the responsibility of the municipality that is supposed to service the area.



***Plate 5: Refuse dumped at the back of informal home at Drie Bruggies, Worcester***

Generally the respondents (56%) are not satisfied with the waste disposal services that are rendered to them. Even though surety is noted about this, it is clear that when specific issues regarding waste disposal services were handled, more than half of the respondents are satisfied on most issues to some degree. Some of the issues raised included storage containers and the frequency of collection.



<b>Service satisfaction</b>	<b>Yes</b>	<b>No</b>	<b>No Response</b>
Satisfaction with waste disposal services	40%	56%	4%
Frequency and days of collection	64%	34%	2%
Times of collection	54%	24%	22%
Collectors on waste trucks	56%	24%	20%
Monthly payments for waste removal services	60%	36%	4%
Payment for removal of additional waste	38%	32%	30%

***Table 9: Resident satisfaction with services***

Residents who were dissatisfied with collection felt that it could take place more than once per week (Table 9). Contrary to this, respondents mention that they are satisfied with the specified waste disposal services. However, since many mentioned that the payment for additional waste was not a feature residents were happy with. The fact that a fee must be paid for the collection of additional waste validated why most respondents answered negatively to the question whether or not they used waste

disposal facilities for other purposes. The few that utilized this service used it specifically to discard their garden refuse.

Residents in the informal settlement felt that collection can occur every second or third week. Interviewees living in the municipal flats had complaints regarding the container size as the bin fills up fairly quickly and tends to overflow. Others are grateful that municipal workers clean up around the bins when they run over and suggested that collection should take place twice per week to avoid health hazards developing.

#### **4.6.2 Levels of satisfaction with times of collection**

Contrary to those dissatisfied with times of collection there were people who responded positively to this issue. This is due to the fact that collection takes place at a time that is convenient i.e. approximately eleven o'clock in the morning or midday, and not during peak hours.

Dissatisfaction was experienced with irregular times of collection as it differed from week to week as indicated by inhabitants and again problems with dogs ripping bags open are prevalent in such cases and the exposed waste harbours flies. Recommendations were made that collection should take place at the same time each collection day; preferably around nine thirty or ten in the mornings as late collections create health risks.

#### **4.6.3 Transportation/ Transfer**

Waste is collected with refuse trucks in the BRD. In Robertson tractor-trailer container systems are used to transport garden refuse disposed of in the masonry structure (Plate 4). In Worcester a container-hoist vehicle is used to collect the skips that are situated at the flats.

Respondents appreciated the attitudes of personnel on the trucks. The sentiments were that they were helpful, friendly, knew their jobs and did not leave waste behind. There was also interest shown in the well-being of workers, it was mentioned by more than one respondent that workers should ride on the trucks and not walk alongside the trucks on hot days. Another concern is the fact that waste is handled with bare hands as workers can get hurt by objects protruding out of bags. It was felt that special gloves

should be made available for this purpose and that a better system be put into place to deal with injuries.

Dissatisfaction was mentioned by twelve respondents who felt that workers on the trucks do not work thoroughly, that they overlook waste, and that a better service can be rendered.

#### **4.7 Recovery and Recycling**

Recycling is not practiced as part of a municipal function in Worcester. The Robertson Municipality has two contractors at source and on the site. Mention was made that with the development of the new site a recycling plant will be established. It can be presumed that the size of the towns and the residential location in relation to the disposal sites contributed to prevalence of recycling as a waste disposal practice.

A few respondents separated waste at home and these were the respondents that were involved in recycling. All those who responded positively resided in Worcester and some affirmed their involvement in recycling. Some respondents provided the reasons for not practicing this waste reducing disposal practice on domestic level as being that the quantity of bags were not sufficient in order for them to separate waste. A sense of eagerness was felt, as one respondent mentioned, “communities need information on the reduction of waste”. Another response was that “if it was requested for the public to do it” they would. The majority felt that one container is not enough for waste separation and for this they would have to buy their own bags, which many were not keen to do. Others thought that there is “no time and no sense in doing this because municipal workers mix... it”. Due to the fact that only one container is available to residents, waste is mixed. From the latter statement it becomes clear that people are not prepared to separate waste as their time and effort is not rewarded. All waste is thrown in waste trucks and absolutely no form of separation is attempted by municipalities. Those who recycled put cardboard, paper, tins, newspaper, glass, etc. into bags and send it to their church for fundraising purposes. The biggest concern with separation and recycling is that no facilities exist to aid the development of this waste reduction practice.

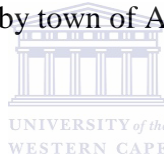


## **4.8 Ultimate disposal**

The final disposal method for Robertson is composting and land-filling, and for Worcester land-filling only. There are no transfer stations in place in both of these towns and waste is carted directly to the landfill sites. Robertson's landfill site is located approximately two kilometers from the center of the town on the McGregor Road and the Worcester landfill site is approximately 1 km away from the nearest suburb. It can be concluded that due to the proximity of the town to the landfill site it will not be economically viable to invest in a transfer station. However, if one thinks environmentally a feature such as this will allow the separation, recycling and reuse of waste to become part of waste disposal practices.

### **4.8.1 Size/capacity of facilities**

The facility in Robertson is 75 000 m<sup>3</sup> in size and the one in Worcester is approximately twenty-five hectares. The capacity of the Worcester facility is 1.6 x 10 m<sup>3</sup>. According to official information the landfill site at Robertson is closed down and waste will be transported to the nearby town of Ashton until a new site is identified.



### **4.8.2 Methods used**

At the Robertson landfill waste is compacted in cells then covered with material on a daily basis. At this facility there is a well-managed composting plant in operation, however there is no information whether composting is part of the rehabilitation process. The Worcester Municipality utilises motorised trucks to collect waste that is transported directly to the site. Dumping by private individuals is also permitted free of charge.

### **4.8.3 Landfill sites**

The general perception of residents was that a landfill site was a place where waste is discarded. However many definitions were provided, respondents defined it as a place where waste is disposed of in an approved manner, and a place where unusable goods are thrown. When referring to disposal of waste more people in Worcester utter the word "dump" and in Robertson "discard". In view of the education levels in both these towns it is surprising that such references are made even though it is not part of daily conversation. The scientific referral did not mean much to those who said they did not



know; it is commonly known in Worcester as a “tip”. The state of the Worcester landfill site leaves much to be desired (Plate 6). The facility is fenced and the only access is through the entrance gate. The location is away from residential areas and has a lifespan of approximately 50 years. The established system at the landfill, as observed by the researcher, was the delivery of waste, sorting to some degree, burning of waste for reduction purposes and then covering the waste with soil.



***Plate 6: Worcester Landfill Site***

The Robertson landfill site on the other hand could be used as an example in terms of the process of rehabilitation when research was conducted. The rehabilitated landfill is covered with grass and on the premises it was found that a composting plant was in operation (Plate 7).



***Plate 7: Rehabilitated landfill site at Robertson***

At that stage it was used as a transfer station and residents were free to dispose of their additional waste. Waste was then transferred to the Ashton landfill site.

#### **4.8.3.1 Access to the Facility**

Access to the Robertson facility was from a good gravel road off the McGregor Road. At the Worcester facility the public has free but controlled access to the landfill site. Access is from a road onto a constructed gravel road about 100 m long to the entrance gate of the landfill site. Gate staff gives directions to the dumping front.

#### **4.8.3.2 Operating times**

Access can be gained to the facility in Robertson 24 hours a day, seven days a week. At the Worcester facility operating times are from sunrise to sunset, six days per week. Residents thus have access to the facilities for the disposal of their garden refuse. However, many do not utilize the facility, except for when their collected waste is taken to the landfill sites.

These facilities are otherwise not used apart from disposing of garden refuse, and were frequented mostly over weekends and during the day, as this is when staff is present. Additionally, visits to the facility varied, being once a week in some cases, once a month, twice per month, every second week, once a year or as needed. The apparent rationale behind this was that access is free and transportation was available.



*Plate 8: Composting plant-Robertson*

#### **4.8.4 Incineration**

##### **Medical and toxic waste and its disposal**

Medical and toxic waste was said not to be the responsibility of the Robertson Municipality. Apparently each medical generator has a contractor at SANUMED and Cannon Hygiene that removed waste as required by practitioners such as doctors, dentists, clinics, funeral undertakers and mortuaries.

In the town of Worcester medical and toxic waste is not discarded at the landfill site. The services of private contractors are not utilised in the town of Worcester, the only ones used are those who remove medical waste for private businesses. There is an agreement between the generator of this type of waste and commercial contractors for the safe removal of hazardous waste

The common meaning of incineration in the BRD as perceived by inhabitants is that it is a place where waste is burned. More educated references includes that it is a method of waste disposal by burning refuse at high temperatures. It was also referred to as an oven where all types of waste are burned to ashes. Mention was also made that it is used for burning human bodies by the municipality and it was assumed to be done legally, and that it was used for recycling purposes. The lack of knowledge about incineration can be because of the fact that this phenomenon is not part of people's daily dialogue and information exchange. Also it can be attributed to the method not being used in this area.

#### **4.9 Managerial Issues**

The question about municipalities merging was met with some knowledgeable answers. Issues such as transportation cost, quality of service delivery and allocation of central sites were raised. Some worried about the number of households that will be serviced by one landfill site, while others felt that services would improve as resources, staff and management would be centralized. Others anticipated the merger as potentially causing managerial problems since certain parts of the towns are still developing.

More than half of the respondents were dissatisfied with the current waste disposal services rendered by the municipality as they experienced problems with the improvement of services, health, tariffs and other related issues.

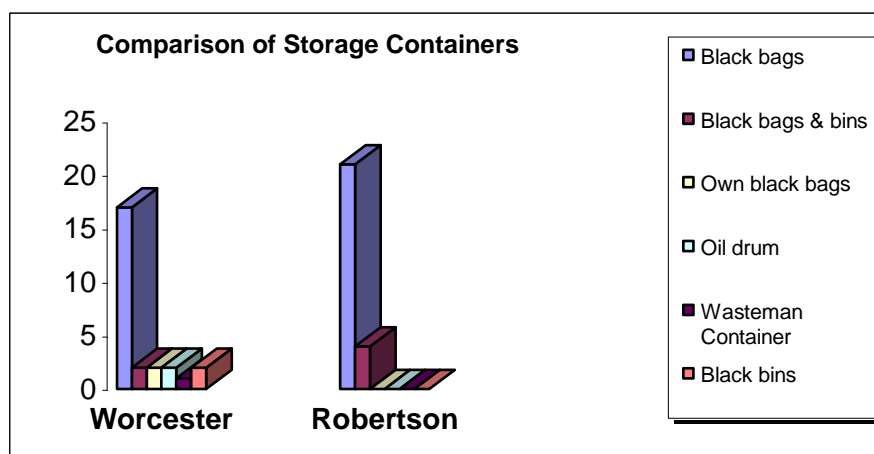
Services were said not to improve in disadvantaged areas. These services were described as pathetic as waste is not collected regularly. The most significant complaint was that of black bags issued by the municipality. This was a major concern to respondents and was an issue mentioned during the administration of questionnaires. Residents felt that the quality and quantity (20-25) of bags that are provided quarterly are poor and inadequate. Suggestions were made that more bags must be issued not only for storage of waste but for the purpose of separating waste to develop a sense of recycling.

#### 4.10 Variation in waste disposal practices in Worcester and Robertson

The waste disposal practices in the BRD were found to differ from the CMA. This section of the chapter will discuss the differences observed particularly storage, collection and transportation.



Storage of waste generated at domestic level was distinctly different. In the BRD refuse was stored in black bags supplied by the municipality (Figure 8).



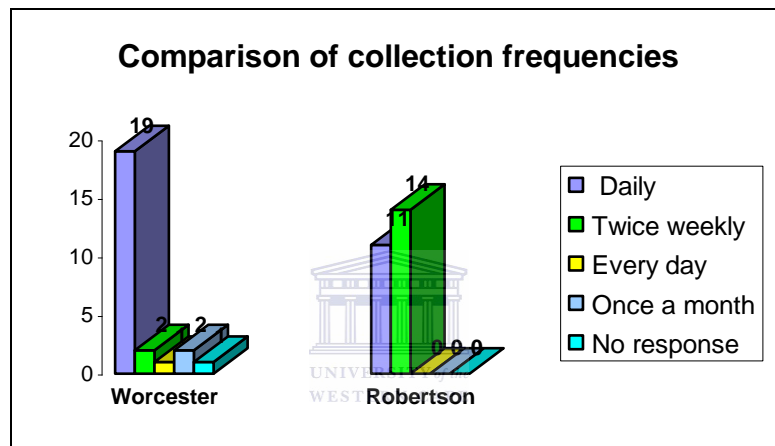
*Figure 8: Comparison of storage containers in Worcester and Robertson*

Those residing in the Drie Bruggies informal settlement surveyed in Worcester employed alternative methods of storage. Methods utilized here included oil drums, plastic bags and acknowledged illegal dumping. Inhabitants of the flats in Worcester

made use of communal storage facilities, which was in the form of a designated container placed in front of the flat servicing between ninety-two and one hundred and forty four households. In Robertson communal facilities in the form of concrete structures for the disposal of garden refuse and skips on the corner of roads for waste was observed.

#### 4.10.1 Collection and Transportation

In both study areas it was found that the frequency of kerbside collection in formal housing areas is once a week (Figure 9). Other neighbourhoods in the towns of Worcester and Robertson were serviced twice a week.



*Figure 9: Comparison of collection frequencies in Worcester and Robertson*

The general mode of transportation is rear-loading hydraulic compactors, utilised for the collection of refuse. The same means are employed in both areas, although other modes are used to transport specific storage containers. Transported waste is then taken to a transfer station or directly to a landfill site. In Worcester the removal of waste from the skips situated in front of the flats is done by means of a container-hoist vehicle equipped to move these containers. In Robertson tractor and trailer container systems are used for the transfer of garden refuse (Plate 3).

#### 4.11 Conclusion

Conclusions can be made that striving for service delivery is achievable but is restricted by poor managerial ability and involvement from relevant official bodies. The strategies employed in the BRD as far as composting plants and rehabilitation of

landfill sites are concerned, can be used as an example to better management thereof in the CMA.

The overall waste management practices in the BRD are implemented as best as can be expected as a smaller area than the CMA is covered. However, there are certain aspects that can be improved upon such as the storage container and frequency of collection.



## **CHAPTER 5 DATA ANALYSIS (Cape Metropolitan Area)**

### **5.1 Cape Metropolitan Area**

Due to the small size of the selected sample it has become more apparent that the validity of the data collected would be questionable. Therefore the use of secondary data will supplement the empirical data collected in the CMA. The data that will be reviewed includes the population groups, gender, and removal status. The evaluation of this data resulted in similarities and trends brought out and provided a basis for more valid comparisons to be drawn.

#### **5.1.1 Description of area**

The 1950 Group Areas Act was designed to create in course of time separate residential areas for different racial groups (Hiemstra, 1953). This Act was invoked harshly in Cape Town as from 1966 and is the origin of the unequal population distribution in Cape Town. Coloureds and Blacks were moved from District Six and other parts of Cape Town, which were declared White Group Areas. This had a major influence on settlement distribution and housing types in Cape Town as about 150 000 people were required to move to new residential areas on the Cape Flats<sup>14</sup>. In these residential areas the dwelling types were built to accommodate the growing coloured and black population groups.

The CMA is the commercial centre of the Western Cape Province (see Figure 10). It poses a vast variety of activities that include commercial and agricultural activities on the periphery. Since these activities lead to job opportunities the influx of people to this centre increases pressure on the existing infrastructure and basic services<sup>15</sup>.

---

<sup>14</sup> <http://www.capetown.gov.za> online-08-11-04

<sup>15</sup> <http://www.cmc.gov.za> – online 08-11-04





Figure 10: Cape Metropolitan Area

Source:Internet<sup>16</sup>

<sup>16</sup> <http://www.aboutcapetown.com/maps.htm-online> 13/11/2006



### ***Population***

According to a study done by the Water Research Commission (1996) an “estimated 21% of the urban population, approximately 4.5 million people, do not have access to adequate waste collection service”. These statistics have changed since this study was done and according to Census 2001 data more than ninety four percent of the total population in the City of Cape Town has formal waste removal by local authority (Table 11). Therefore, with population growth it can be expected that statistics with regards to service delivery either stay constant or increase.

The population distribution in the CMA shows that the coloured population makes up almost half (48.1%) of the total (Table 10). This distribution is mainly found on the Cape Flats where fieldwork was done.

<b>Population Group</b>	<b>City of Cape Town</b>	<b>%</b>
Black African	916,695	31.7%
Coloured	1,392,426	48.1%
Indian or Asian	41,552	1.4%
White	542,567	18.8%
<b>Total</b>	<b>2,893,240</b>	<b>100.0%</b>

***Table 10: Population distribution by race in the CMA***

*Source: Census 2001*

UNIVERSITY OF  
WESTERN CAPE

### ***Housing***

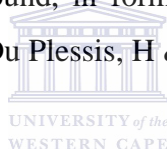
The dwelling types in the City of Cape Town according to Census data range from houses built with bricks (57.3%) to informal dwellings (14.2%) not in back yards (Table 11).

Dwelling Type	Number of units	
House or brick structure on a separate stand or yard	445,654	57.3%
Traditional dwelling/hut/structure made of traditional materials	14,879	1.9%
Flat in block of flats	75,457	9.7%
Town/cluster/semi-detached house (simplex; duplex; triplex)	53,258	6.9%
House/flat/room in back yard	19,177	2.5%
Informal dwelling/shack in back yard	32,894	4.2%
Informal dwelling/shack NOT in back yard	110,212	14.2%
Room/flatlet not in back yard but on shared property	6,047	0.8%
Caravan or tent	2,054	0.3%
Private ship/boat	215	0.0%
Not applicable (living quarters is not housing unit)	17,547	2.3%
<b>Total</b>	<b>777,393</b>	<b>100.0%</b>

*Table 11: Dwelling type in the City of Cape Town*

*Source: Census Data 2001*

Housing types form an integral part of the research since the waste disposal services depend on whether an area is informal or formally settled. In informal housing areas unfavourable conditions are still found, in formal areas where kerbside collection is done, better services are rendered (Du Plessis, H & Gophe, M, 2002).



### 5.1.2 Demographic profile of sample

The CMA has a predominantly coloured populace, although the research sample (50) reflects equal distribution and not majority (Table 10).

	Number
Privately owned houses (Mixed)	14
Municipal houses (Coloured population)	14
Municipal houses (Black population)	14
Municipal-built flats (Coloured)	4
Informal settlement (Mixed)	4
<b>Total</b>	<b>50</b>

*Table 12: Distribution of housing types in sampled areas in the CMA*

The settlement dissemination was similar although mixed racial groups are living in previously white living areas (Table 12). In primarily coloured areas it was found that blacks and coloured shared living space. In the area of Khayelitsha it was evident that amongst the research sample no other racial groupings resided here. However, in the

informal settlement called Poek se Bos (opposite the Athlone Industrial area in Rylands), there are both coloured and black people.

### 5.1.3 Marital status

More than half of the sample was married (54%) suggesting that as in the BRD most households will be occupied by more than two tenants.

Directly related to the marital status, the number of people per household must be taken into account. In the CMA it was found that just over a quarter (13) of the sample had four people residing in one dwelling (Table 13). In one instance up to fifteen people occupied a two-roomed dwelling and this is indicative of more waste being generated by this household. As in the BRD no specific question in the questionnaire was asked verify how many adults and children lived in one household.

Number	Frequency
1 person	2
2 people	5
3 people	10
4 people	13
5 people	6
6 people	4
7 people	2
8 people	4
9 people	3
10 or more	1
<b>Total</b>	<b>50</b>

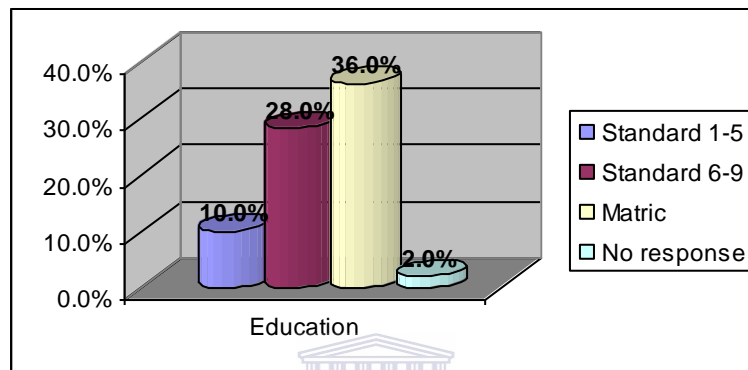
*Table 13: Sizes of households in the CMA sample*

### 5.1.4 Income

As the employment status was not included in the questionnaire there is no definite section dealing with this. In the CMA it was noticed that the prevalent number of the sample earned more than R2 000 or more per month (58%). The respondent getting a state pension categorised her income in the grouping provided. The other six percent giving no responses did not indicate whether they were actively employed due to the afore-mentioned reason. Overall the income levels in the CMA can possibly be linked with the generation of waste due to the expenditure on consumable household goods.

### 5.1.5 Education

The levels of education reveal similar tendencies to those in the BRD. The most perceptible category, according to Census 2001 data, was that of the secondary school education showing that a large number (32.3%) graduated from high school. The sample collected in the CMA follow this trend where 36% of the sample had matric education. In the CMA education institutions are more accessible and this may contribute to the percentage of matriculants (Figure 11) and better access exists to these institutions.



*Figure 11: Education level of respondents in the CMA*



### 5.1.6 Duration of residency

A large number of respondents (35) answered that they have resided in the CMA for five years or more (Table 14). Some here moved from where they lived under the apartheid ruling of the Group Areas Act and they ended up on the Cape Flats. For these and others living at the same address for more than five years it meant that they could respond to the questions more informatively as they have witnessed the changes in the waste disposal practices and management.

Duration in years	Number
1 month-4 years	15
5-10 years	17
11-14 years	1
15-20 years	6
21-25 years	7
26-30 years	2
31 years and longer	2
<b>Total</b>	<b>50</b>

*Table 14: Duration of residence in the CMA*

## 5.2 Waste Disposal Issues

As in the BRD this study focused on the disposal practice of household waste.

### 5.2.1 Waste Generation

The CMA is smaller than the BRD on a geographical scale and has fewer agricultural activities. Due to the fact that the CMA is a more urbanised area, people earn more money, can spend more and therefore create more waste. The services rendered by the Municipality are as follow:

- the disposal of general waste at landfill sites,
- disposing hazardous waste by co-disposing at landfill sites,
- operating regional transfer stations for the transfer of general waste to landfill sites,
- manufacturing and distributing compost,
- licensing procedure for the permitting of landfill sites and
- facilitating of integrated waste management planning.



UNIVERSITY of the

The nature of waste in the CMA, as in the BRD, is mixed household waste. Waste was specified as paper, food (kitchen waste), tins, bottles, glass, plastic and vegetable peels. Due to the size and capacity (240 liter) of the bins they are kept on the property, mainly near the kitchen door, depending on accessibility. Waste is thus first stored in a plastic bag after which it is taken outside to be thrown in the bin.

### 5.5.2 Storage

In the CMA the most widespread means of waste storage is the 240-liter polycart (wheelie bin) (Fuggle & Rabie, 1992). The majority of the respondents were in possession of the municipal required storage container. Bins are often full and waste protrudes from it. It was also noted that people number their bins as a sign of ownership as it often used as a multi-purpose container due its characteristic wheels.

A combination-utilisation of bags and the black bins are utilised in the CMA, as people prefer to throw waste in a plastic bag and at the end of the day put it in the bin. The ten

percent that uses bags as a means of storage were found to reside in Kommetjie, Ysterplaat, Sea Point, Rosebank and Muizenberg.

### 5.2.3 Type of container

Containers used for storing household waste in the CMA are a 240-litre black wheelie bin (Plate 9). Due to the capacity of the container it is collected only once a week and these containers are stored on the property and put on the kerb side on the specified collection days (Table 15).

	<b>Number</b>	<b>Percentage</b>
Black bags & bins	13	26%
Black bins	32	64%
Own black bags	5	10%
<b>Total</b>	<b>50</b>	<b>100%</b>

*Table 15: Storage types and daily use*

In the informal settlement investigated it was noticed that three or four households utilise one bin in which the waste is stored. Here more than one hundred and ten families are housed and use a total of twenty bins made available by the municipality. With the influx of people and growth of the settlement the number of bins remains unchanged, leading to dumping on the edges of the informal settlement. Household waste is stored in plastic bags inside of the home and after which it is discarded in the communal bins.

In the flats each of the forty-two households has their assigned bins that are collected once a week. These bins can be found on and at the bottom of the staircase depending on the agreement with other tenants (Plate 9).



***Plate 9: Storage of bins on staircase of flat***

When bins are stored on the ground level safety measures implemented by the municipality to ensure the security of the bins are in the form of steel locks attached to pillars. These measures were implemented due to theft and as these bins are used for purposes other than the storage of waste (Plate 10).



***Plate10: Waste storage bins used for transportation.***

Residents living on the second and third floors tend to keep their bins on the ground floor under lock and key (Plate 11). Bins kept on the staircase inhibit movement on the staircases and hanging of laundry.



***Plate 11: Device used to secure bins on ground floor of flats***

Committees were formed as part of the Urban Renewal project initiated by the City of Cape Town where the unemployed benefit from lining up bins and cleaning them after collection.

#### 5.2.4 Collection

In the CMA collection occurs predominantly once a week. This is in the case for formal housing areas as well as the informal settlement that was investigated. In the CMA according to Census data more than ninety percent of the population have their waste removed at least once a week (Table 16). The data supports the empirical data collected, as trends are similar irrespective of the difference in totals.

<b>Removal Status as per individual household</b>	<b>City of Cape Town</b>	<b>%</b>
Removed by local authority at least once a week	732,275	94.2%
Removed by local authority less often	9,393	1.2%
Communal refuse dump	9,806	1.3%
Own refuse dump	15,162	2.0%
No rubbish disposal	10,757	1.4%
<b>Total</b>	<b>777,393</b>	<b>100.0%</b>

**Table 16: Waste removal status in the City of Cape Town** Source: Census Data 2001



Due to the capacity of the container there is a need for collection only once a week. The bin is hauled onto the truck and waste is then thrown into the compartment of the truck where it is compressed.

It is apparent that the greater majority of respondents have set collection days for their respective areas and it is clear that a standard in frequency of collection is practiced (Table 17). As stated by Du Plessis & Gophe (2002) it is the quality of services that require attention. It was discovered that the same type of storage bins are utilised in all areas of the CMA.

<b>Frequency of collection</b>	<b>Frequency</b>	<b>Percentage</b>
Once a week	47	94%
Twice a week	3	6%
<b>Total</b>	<b>50</b>	<b>100.0%</b>

**Table 17: Frequency of waste collection in study area per household**



### 5.2.5 Levels of satisfaction with Service Delivery

Generally the level of service delivery complies with what residents expect which include frequent and timeous collection. There is a clear indication of discontentment regarding the issue relating to the payment for additional waste, as not everyone could afford it.

When asked if they were satisfied with the waste disposal services delivered by the relevant municipalities, more than half were pleased. Those satisfied agreed that if they "...phone to collect waste dumped opposite my premises" it is done. Others were impressed with the state of their roads after collection as one respondent said "...they don't mess, it is always neat after collection." Those residing in the flats agreed that they could see the difference, collection take place on specified days and that they do not have to carry their bins down from the second storey as it is just unlocked and pushed to where waste is to be collected. Some respondents appreciated the system as one that is working "okay" as well as for the fact that waste collectors are always on time and do not strike.



<b>Service satisfaction</b>	<b>Yes</b>	<b>No</b>	<b>Total</b>
Satisfaction with waste disposal services	64%	34%	98%
Frequency and days of collection	70%	30%	100%
Times of collection	84%	12%	96%
Collectors on waste trucks	70%	12%	82%
Monthly payments for waste removal services	60%	30%	90%
Payment for removal of additional waste	30%	32%	62%

***Table 18: Resident satisfaction with services***

The general tendency was that respondents were satisfied with service delivery. However, residents were mostly dissatisfied with the payment for additional waste (Table 18). The overall feeling was that rates are paid for the removal of waste and that additional payments are not necessary. This is due to the fact that some respondents either did not respond and assumptions can be made that there was no interest in

whether services were satisfactory or an indication that they were not happy with the services and did not bother to answer.

Dissatisfaction was voiced over the fact that rates are being paid but streets are still full of rubbish and drains are blocked. A concerned respondent felt that "...refuse collection charges have increased, levels of service have decreased i.e. no more separate collection of garden refuse". For some individuals collection once a week was not sufficient which can be attributed to the number of people per household. Complaints on the subject of waste lying around were mentioned as well as bins being thrown on the sidewalks after collection (Plate 12).



*Plate 12: Before and after collection*

Concurrent with the concern with collection methods there is apprehension about health hazards that can be caused by illegal dumping due to the number of collection days. Also concerns were brought up with regards to separation and recycling of waste. One individual suggested that, "... they need to start thinking in terms of compulsory separation and recycling."

#### **5.2.6 Levels of satisfaction with time of collection**

A large number of interviewees in the CMA were satisfied with times of collection. General sentiments were of approval as it occurs early in the mornings although some felt that in winter it was too early, indicating that times are constant. Collection times range from seven to eleven o'clock in the morning. One individual felt that the collection process should be supervised and that refuse collectors should "...also return your bin to your property." The few that professed disappointment related that

collection can take place earlier as “...the dogs mess with the bins...” causing unhygienic circumstances.

In the less advantaged area of Khayelitsha people felt that waste should be removed earlier as one in the afternoon was too late.

### **5.2.7 Transportation/Transfer**

For the collection of household waste rear-end loaders are used. The bin is hauled onto a device that empties the bin into the truck. The waste is then compressed and pushed towards the front of the truck. Six men including the driver man each truck.

Overall satisfaction with the attitudes of workers on waste trucks was felt by a large number of respondents. Reasons presented were that they are always helpful and they work well together as a team. Although a number of respondents answered positively to this, others criticised the fact that their bins are being thrown in the road and that litter is left behind. As far as the welfare of workers were concerned one respondent could not get over the fact that “...die manne so moet hardloop nie. Die bestuurder kan seker meer geduldig wees.” (“...the guys have to run so much. The driver can surely be a bit more patient”). In general respondents were satisfied with services rendered raised concerns with damaged bins that are not replaced and that they have to pay for.

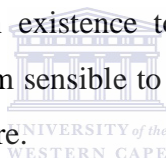
After collection waste is taken to the Athlone Refuse Transfer Station where waste is compacted, baled and transported to landfill sites putting strain on public roads. The concept of “Bale and Rail” was commissioned in August 1995 and from then on waste was processed in this way and taken to Vissershok Landfill site (Cape Metropolitan Council, 2002).

### **5.2.8 Recovery /Processing**

Separation and recycling are practices that are not enforced by the municipality and are done by residents in order to raise funds for organisations or individuals to supplement the incomes of these organisations. The environmentally aware minority also enjoys financial gain from recycling, since they are paid for recyclables sold to recycling depots.

Evidently and not surprisingly in the CMA sample it was found that almost seventy percent of respondents did not separate waste at domestic level. Motivation for this ranges from there being "...no purpose in separating our waste as there is no specific place to take it except for glass, bottles and newspapers which is taken to a specified place." People involved in separation could state that they recycle newspapers, glass, tins and bottles and that they use kitchen waste to make compost. Another environmentally aware person stated, "I try very hard to separate glass from my household waste..." Those that have a need to supplement their salary use recyclables for this purpose. Residing in the informal settlement and being unemployed the residents of Poek se Bos collect materials such as tin, cardboard and glass to earn extra money.

Waste separation is often a drawn-out affair and people felt that they would be wasting their time and energy as everything is thrown into the waste truck. The most impressive and obvious line of reasoning followed by certain respondents was when they mentioned that no facilities are in existence to cope with the processing of these materials. For many it does not seem sensible to have only one container and yet to be expected to be environmentally aware.



One respondent asked the question, "How will it be separated?" The subject of waste separation is puzzling to many as the municipalities preaches it but does not give people the tools to accomplish it.

### **5.2.9 Recycling**

Most interviewees practicing separation are engaged in recycling. Many send off newspapers and glass to their local schools or take it to the glass bank in the area (commonly suburban areas). Unfortunately on the Cape Flats facilities are minimal or not easily accessible. Residents living in Poek se Bos recycle cardboard, glass, paper and tins to supplement their income and finds it easier due to the proximity of the scrap yard and recycling depot to their location. Others use recyclables to produce crafts as part of a programme initiated by the Municipality they are involved with.

It can be concluded that people are prepared to involve themselves in activities such as the separation of waste at household level as well as engaging in recycling and reusing

of products. If people are properly introduced to these programs/processes, and are facilitated by officials with expertise, the potential for success is immense.

### 5.2.10 Ultimate disposal

In the CMA the ultimate disposal method for household waste is land-filling. An estimated 3 500 tons per day are handled at the city's transfer stations and disposal sites. Due to landfill sites such as Brackenfell, Faure, and Swartklip being closed down the surplus waste will be absorbed by Vissershok landfill site and its airspace will then decrease (Cape Metropolitan Council, 2002).

Statistics obtained from the Department of Environmental Affairs and Development Planning's (DEA & DP) Pollution and Waste Directorate contradict the statistics above since five of the landfill sites mentioned are still operating (except Swartklip that is closed) and four have permits. The other concern with this data is that the years in which the sites were to be closed do not correspond with the statistics obtained by the City of Cape Town.



### 5.2.11 Land-filling

Landfill sites are the primary method of waste disposal in the CMA. There are seven, of which four are still permitted to operate. These are Coastal Park, the two sites at Vissershok, and the Bellville landfill sites.

Name of site	Location	Life span	Remaining Air space	Waste types accepted	Volumes (ton/an)	Soil	Licensed/Permit
Coastal Park	Muizenberg	2013	2 900 000	Mixed/household	176 000	Sandy	Applied EIA phase
Vissershok (CMC)	Frankdale Road	2027	11 000 000	General/Hazardous	290 800	Clay	Permitted `98
Vissershok (WMF)	Frankdale Road	2010	2 000 000	Hazardous	171 000	Clay	Permitted `97
Swartklip	Khayelitsha	2000	8 00 000	General	245 000	Sandy	Applied (closure)
Bellville (Sacks Circle)	Bellville South	2005	2 900 000	Household, Industry	59 200	Sandy	Applied
Brackenfell	Brackenfell	2002	49 000	Household, Trade	14 300	Granite rock	Permitted `95
Faure	Blue Downs	2000		General	20 000		None

**Table 19: Status of landfill sites in the CMA**

*Data adapted from CMC website:2003*

There are six operational general landfill sites in the CMA. Two have obtained operating permits from the Department of Water Affairs and Forestry (DWAF). According to the National Waste Management Strategy, all the landfill sites will be registered, permitted and operating in accordance with the Minimum Requirements by 2005<sup>17</sup>. This however is found not to be the case since most landfill sites are not permitted and the ones that are presumed to be closed are still operating. Three of the seven landfill sites should have been closed but are still in operation despite the lifespan and capacity thereof (Table 19).

Five of the six landfill sites in the CMA are located on the Cape Flats (See Figure 12). It must be noted that the landfill sites mentioned exclude the Vissershok site for the disposal of hazardous waste. The location of these sites means that poor communities have to bear the burden caused by pollution directly related to waste generation. The primary and most imperative concern is the possibility of the water aquifer being polluted and that the reality that most of these landfill sites is nearing the end of their lifespan. A conservative projection of an economic growth rate of 1,8% per annum indicates amplification of the total waste output to 70% by the population of the Western Cape Province by the year 2030 (DEA & DP, 2005).

The CMA respondents who knew what a landfill site was had a clear understanding about the ultimate disposal of their waste. A landfill site according to the majority is the place where their waste is taken after collection. A selected few offered rather academic definitions such as it being “a legally recognised facility to dispose of specific kinds of waste in a way that is not harmful to the environment”; it being a “...regulated municipal approved dumping site in containers that are taken away”; and others viewed it as “...open land used for dumping waste, layers waste is covered with sand...”, “...a site where waste is deposited, a place put aside by the municipality ...”, and “...where all waste is dumped, it is a site that is legally accepted by council.”

Depending on the area where respondents resided, mention was made of sites such as Vissershok, Muizenberg, Swartklip, Strandfontein and Panorama landfill sites. In most cases it was known that waste is taken to a landfill site and that incineration did not

---

<sup>17</sup> [cmc.gov.za/peh/soe/waste\\_2htm](http://cmc.gov.za/peh/soe/waste_2htm) – online 22/09/04

play a big role in the waste disposal process in the CMA. Just over forty percent of the sample either did not reply or had no knowledge of the ultimate disposal of waste. United knowledge may be due to the slight exposure to issues relating to waste. The education level and exposure either educationally or through the media plays an important role in people's conception and perception of issues such as ultimate waste disposal sites. It was found that in some cases the workings of landfill sites could not be explained even if people knew of their existence.





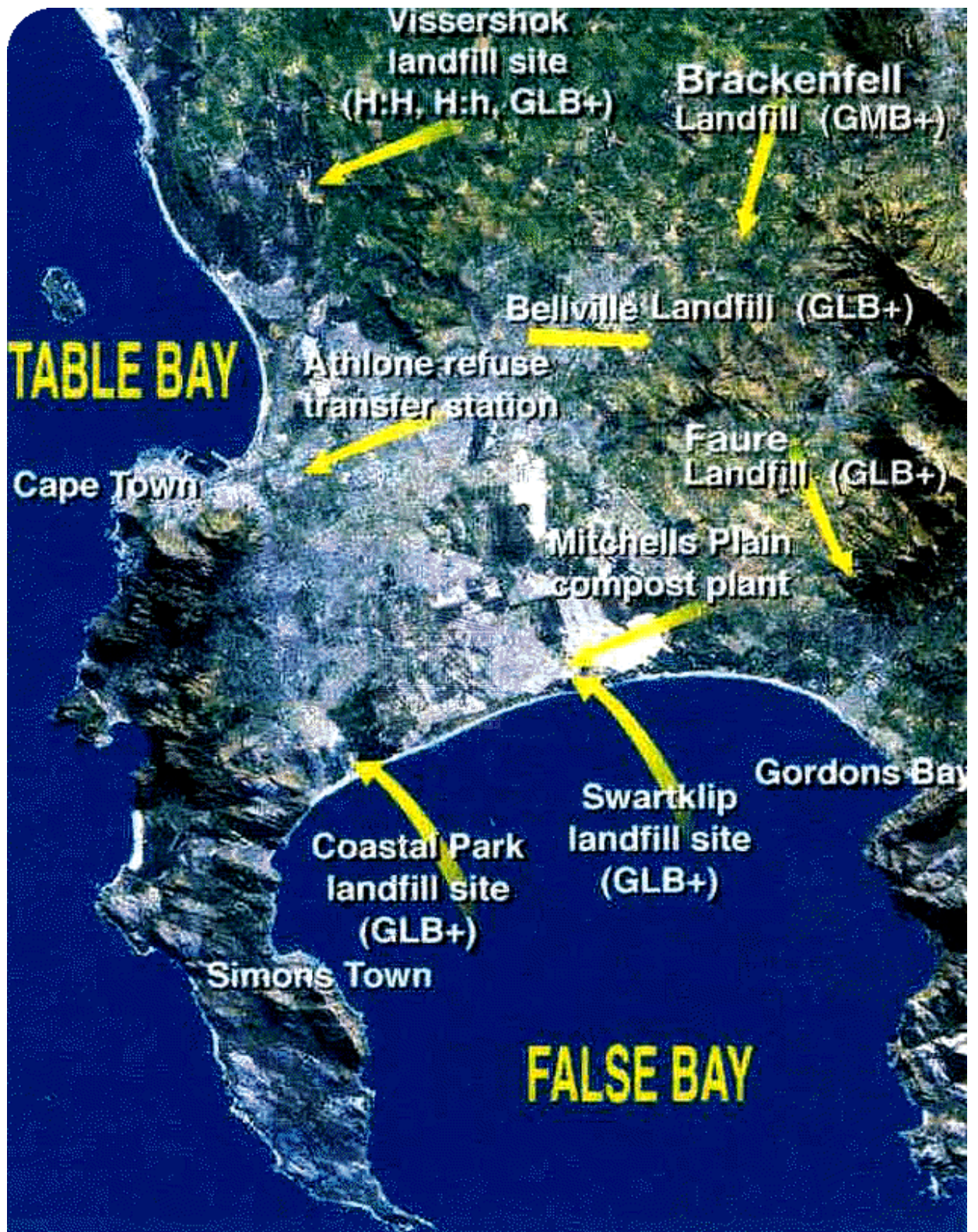


Figure 12: Location of waste disposal sites and transfer stations in the CMA



### **5.2.12 Incineration**

Incineration is commonly perceived by respondents in the CMA as equipment that burns products, a facility, machine, oven, device or furnace that burns waste. Other respondents referred to it as being the dumpsite or where it is burned and the product reused.

Due to the fact that the word incineration is not part of people's everyday conversation some had no idea of what it was. Misconception can be expected in a case like this and it was found that people referred to it as the burning of bodies.

### **5.2.13 Use of the facilities**

The majority of respondents do not make use of the waste disposal facilities. Those who do use it use it for the disposal of garden refuse. No indication was made as to where these sites were located.

### **5.2.14 Managerial issues**

More than half of the respondents confirmed knowledge of merging municipalities. The process of the merger involved the seven former municipalities merging into one. Those that were aware had concerns with regard to service quality as well as efficiency of the existing state of affairs and the subsequent impacts of the amalgamation. More informed comments were made where beliefs were that no difference would be observed as each municipality had a responsibility to the areas in their control. Another reply came that "...each place had its own government and not all of them think the same. We can have the same law/rule but it depends on how people handle it." Clear statements such as this provide an understanding of how people think and feel about issues that influence their everyday life.

At the time the questionnaires were administered the majority of replies were affirmative with the current state of waste disposal services delivered by the respective municipalities. Positive views were raised as to the number of days of collection that is acceptable however concerns were introduced regarding the removal of garden refuse that will be considered an additional service as from September 2003. Other constructive responses regarding this issue were that it is always done on time and does not cause refuse to accumulate. Changes in the immediate surroundings of respondents

were seen and for others the system worked fine as waste is collected and the environment is kept clean.

Those residing in flats felt that the workers do not perform adequately as litter still lay around after collection. One respondent felt that supervision was needed as it "...leads to drunk people doing a poor job." This comment must have been made on account of knowledge about undisciplined workers. No speculation will be entered into about the aforementioned comment, as concrete proof is nonexistent.

In areas such as Khayelitsha admitted illegal dumping was the order of the day as infrequent collection times are experienced and refuse is collected either too late or not at all on specified days. This seems to be an attempt to justify these actions. Mention was also made pertaining to issues of health hazards because of illegal dumping practices. These concerns were especially prevalent on the subject of fly infestation and conditions not conducive to good health especially in the vicinity where children play.



## **CHAPTER 6 CONCLUSION**

The CMA has a well managed and functioning waste management strategy, but certain methods could be duplicated from the BRD. The BRD on the other hand has a well-operated system in place as the areas that are serviced are smaller in size.

As this study is comparative in character recommendations will be provided according to the waste disposal issues dealt with in the previous chapter.

### **6.1 Comparisons**

The demographic profiles of the study areas, and waste disposal issues such as storage, collection and transportation, recovery and recycling, ultimate disposal and incineration in the two study areas will be summarised.

#### **6.1.1 Variations**

In both study areas it was anticipated that similarities and differences would be found in waste management and disposal practices. Correlation in terms of the dispersal of housing areas within the study areas was observed. Conversely, the two areas were also similar as far as the population groupings is concerned but varied on the level of population numbers when viewed in relation to the size of the CMA compared and the towns of Worcester and Robertson in the BRD.

#### **6.1.2 Demographic Profile**

As far as age distribution was concerned, results revealed that the economically active component of the population residing in the towns of Worcester, Robertson and the CMA was between the age of eighteen and fifty years. While the employable age of the sample is notable, it is not representative of the employment status in the study area. The income levels of respondents were encouraging but, against statistics from Census 2001, employment rates do not comply with standard percentages. This however is depicted in Census 2001 data where in the City of Cape Town approximately half (939,466) of the total (1,990,548) were employed. In the towns of Worcester and Robertson, the areas of Zwelethemba (2518 of 9816) and Nkqubela (508 of 2158) respectively showed that barely a third of the total of people is employed. The other

areas within the towns have at least half of the total in jobs. In relation to the study the population residing in the areas of Zwelethemba in Worcester and Nkqubela in Robertson is mainly black and a large proportion is unemployed. This might be attributed to seasonal employment often found in areas of the BRD where people have employment for a short period of time depending on the harvesting of crops.

Furthermore trends are similar as far as the demographic compilation of the samples in both areas are concerned i.e. gender distribution, marital status, income levels, and education.

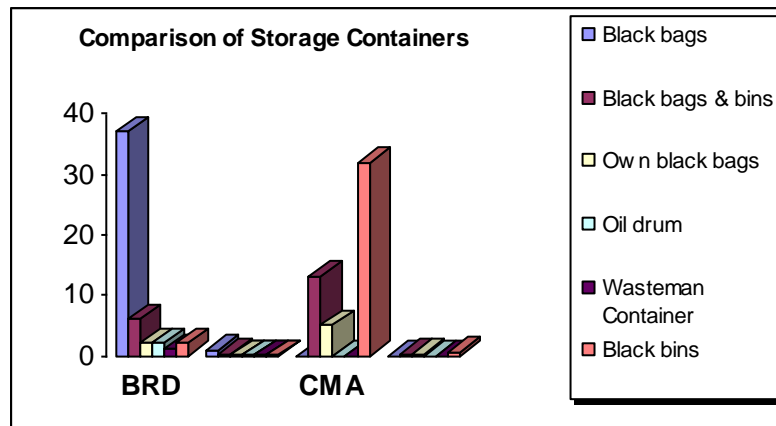
### **6.1.3 Waste disposal issues**

In view of the fact that this study concentrated on household waste it resulted in correlations and diversities in the collection frequencies and transport means as well as storage container types. The CMA exhibited similar patterns to the BRD in terms of the modes of transportation of waste, however the frequencies of collection differ, as do the types of storage. Furthermore, in the BRD Worcester and Robertson used additional modes of transport. The creation of waste and the disposal thereof was identical in that waste generated was domestic waste and that the ultimate disposal thereof was land-filling.

### **6.1.4 Storage**

In the CMA it was found that a standard type (the wheelie bin) and size (240l) bin was utilised for household waste (Plate 9). A total of more than one hundred and ten households use twenty wheelie bins. Due to the versatility of these wheelie bins they are often used for more than just the purpose of storing waste (for example, the transportation of goods as seen in Plate 10). In Poek se Bos, the informal settlement investigated in the CMA, residents make use of communal storage containers where more than one household disposes of waste in one municipally-issued bin.

In the towns of Worcester and Robertson black bags were the predominant storage container used. The quality and amount of bags received were not satisfactory as many respondents queried this (Figure 13).



*Figure 13: Comparison of storage containers in the BRD and the CMA*

### 6.1.5 Collection and transportation

The informal settlement in the CMA was serviced once a week, as were the formal residential areas.

### 6.1.6 Recovery and recycling

In the CMA it was found that more respondents were conscious of, and engaging in, the processes of separation and recycling at a domestic level. This could, in all probability, be due to awareness programmes that are run by the municipality as well as the fact that people are conscious and clued-up as to the monetary gain from recyclable goods. The participation in the separation of waste and recycling at household level, based on the samples drawn in the towns of Worcester and Robertson, was minimal.

Those involved in these practices did it for fundraising purposes for schools and churches. Valid concerns and reasons were given for their non-involvement in these practices. These included that it would be a waste of time and that different types of waste are mixed when collected, so there would be no sense in being involved in the separation and recycling process. Suggestions were made regarding recycling and it was felt that more resources should be made available: black bags in the case of the BRD and standardised containers in the CMA.

### 6.1.7 Ultimate disposal

Municipalities servicing these areas use landfill sites to dispose of domestic refuse. Due to the size of the CMA and surrounding municipal areas, one landfill site receives waste

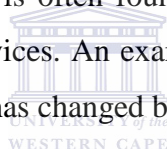
from more than one area. In the BRD each town, depending on its size and proximity to other towns, has its own landfill site.

### **6.1.8 Incineration**

No incineration was performed in order to minimise domestic waste. These facilities were found to be useful for the burning of medical waste. In both the study areas the waste management were found to be principally similar. In view of discussions above, it is possible that certain issues that have been highlighted need to be incorporated into municipal strategies.

### **6.1.9 Conclusion**

It is apparent that the implementation of the waste management processes is in place and practiced. This becomes apparent in the data on reliable waste collection that happens consistently as well as the containers that are provided by the local authority. Areas that require attention are the standard of service delivery in especially less advantaged areas. In these areas it is often found that the quality of infrastructure is poor, inhibiting the standard of services. An example of inadequate service delivery is the situation in Khayelitsha, which has changed but not improved to standard.



The other issue that need to be addressed is that of the execution of recycling programmes. Respondents have shown an interest and eagerness to participate, and need different types of facilities to practice this waste reduction practice. The implementation strategies employed by CMA can thus be used as an example for the municipalities in the BRD as far as waste disposal practices and management is concerned.

## **6.2 Recommendations**

### **6.2.1 Waste disposal issues**

In general the waste disposal issues are implemented efficiently as far as the relevant municipalities could manage. The administrative overhead incurred through the merging of municipalities might have hampered certain administrative functions. Although this is one concern, the functioning of service delivery has stayed the same since the National Waste Management Strategy is designed in such a way that even

though municipal boundaries change, the strategy and its implementation remains responsive to change.

### **6.2.2 Storage**

The type of storage container i.e. black bags provided and utilised in the BRD, is of a poor quality and the number of bags is not enough for the amount of waste generated.

The areas where improvement is needed include the following:

- the type of storage container for waste which will prompt savings relating to, for example, maintenance of vehicles and labour,
- the quality of the black bags and the amounts provided were insufficient,
- more Wasteman containers for, and on both sides of the flats for convenience of residents.

Recommendations related to the types of storage containers were made by respondents suggesting that the quality should be improved and the amount supplied increased, not only for storage of waste but to aid waste separation on a domestic level. Perhaps complete transformation is needed with regards to the type of container. This will lead to fewer days for collection and as in the CMA the capacity of the container will hold waste for at least a week.

### **6.2.3 Collection and transportation**

The frequency of collection in the CMA was found to be satisfactory, as was the means of transportation. However, in the BRD, respondents recommended more frequent collection as the quality and storage container type was not adequate to handle the volumes of waste generated by households. The Wasteman containers found at the flats in Worcester and on the corners of streets in Robertson can be emptied more frequently to avoid possible health hazards. With the upgrade of storage containers better services will be rendered.

### **6.2.4 Recovery and Recycling**

In both the study areas the processes of recovery and recycling are not practiced at a desirable level by local authorities. The problem arises when people are interested and

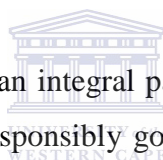
enthusiastic to participate in the separation and recycling process and no facilities are available to promote it. Local authorities have the responsibility to build on this eagerness in order to improve our environment and create a sense of ownership amongst society. With landfills being closed and limited available land for new sites remaining, the reduction of waste will determine the amount of waste landfilled.

### **6.2.5 Ultimate disposal**

Of seven of the landfill sites located in the CMA only four are still permitted to operate. With the growing population and inadequate land for future sites, the only option is to reduce the production of waste as much as possible. Therefore the participation in recycling and the reuse of products plays an imperative role in the success of the implementation of waste management strategies on national and local level, in rural or urban areas. It is thus recommended that the municipalities take a more active role in the involvement of the above-mentioned processes.

### **6.3 Conclusions**

Waste disposal management forms an integral part of our daily life and therefore they affect society as a whole. To act responsibly good examples need to be followed and since the examples set by some municipalities are good only as far as policy goes, the implementation is poor and therefore it is difficult for residents to follow best practices. The most important aspect to succeeding in the improvement of the state of our surroundings is to educate and teach that every action has a reaction. Thus, starting with programmes at school level and amongst the unemployed to empower them to make a change is imperative. The study shows that people are prepared to separate their waste at domestic level and are involved in recycling but minimal or no facilities are available. Policies and plans are in place on municipal level but the implementation thereof is not as successful as planned. Therefore the involvement of communities in environmental management is important as the generation of waste start at domestic level and can be minimised if proper facilities are in place. The involvement of communities can be used to the advantage of municipalities providing that incentives be put in place in the form of creation of job opportunities that lead to compensation, monetary or other wise.





With the merging of the municipalities in the Western Cape and the BRD transformation was presumed as far as service delivery was concerned, as more responsibility would be put onto one municipality. This research shows that no drastic changes have occurred. The research was of a comparative nature and was initially deemed to be different. Both the study areas have waste management strategies that are implemented and the research illustrated that variations were found.

In conclusion, it is clear that similarities and differences were found in the two study areas and lessons in the implementation of strategies can be gained both ways. The successful composting plant that is up and running in the town of Robertson as part of the rehabilitation of the closed landfill site is an example that the CMA can use as part of future rehabilitation programs for closed landfill sites.

A general yet important finding of the research is the inconsistency of data from official sources. It is thus recommended that the relevant authorities consult and create a standardised database that is updated on a regular basis.



## **REFERENCES:**

- Agunwamba J.C, Egbuniwe N. and Ogwueleka T.C. (2003). “*Least Cost Management Of Solid Waste Collection*” *Journal for Solid Waste Technology and Management*, Vol.29, No.3, August 2003
- Barnard, D. (1999). *Environmental Law for All*. Cape Town, CTO Books
- Bernstein, J. (1993). *Alternative Approaches to Pollution Control and Waste Management: Regulatory and Economic Instruments*, Washington D.C: World Bank
- Berry, B.J.L. & Horton, F.E. (1974). *Urban Environmental Management: Planning for Pollution Control*, Engelwood Cliffs, New Jersey: Prentice Hall
- Botkin, D & Keller, E. (1995). *Environmental Science: Earth as a Living Planet*, New York John Wiley.
- Breede River District Municipality, (1999). *Matroosberg: Geïntegreerde Ontwikkelingsplan 1999: Terugvoering aan Gemeenskap Ingevolge Artikel 10G (1) (g) van die Oorgangswet*
- Bryant, C.R., Russwurm, L. & Mc Lellan, A.G. (1983). *The City's Countryside: Land and its Management in the Rural-urban fringe*, London: Longman
- Busch, N.J. (1992). *The Planning of Waste Management in Denmark*, Interplan No.10
- Cape Argus, (2002). “*Garbage set to Power the City.*” *The Cape Argus*, 14 February: 1&6
- Cape Times , (2002). “*Recycling Seen as a Waste of Time for Most Households.*” *The Cape Times*, 27 February:5
- Cape Argus, (2003). “*Recycling out, Incineration in.*” *The Cape Argus*, 05
- Cape Metropolitan Council. (2002).”*Responsible and Environment Friendly Waste Management*” Cape Town.
- Cape Town (City Council). (1975). *Supervisors Course Manual*, Cape Town City Council.
- Cape Town, (City Council) (1982), *Organisational Reform of Local Government Services in Greater Cape Town, Recommendations and Findings*, Vol. 1, Chapters 4,5,6,7 (pp.117-131) & Chapters 8,9 (pp.463-473)
- Chang, S. & Cramer, R. (2003).”*The Potential for reduction of Landfill Waste by Recycling and Mining of Construction and Demolition Waste at the White Street Landfill, Greensboro, North Carolina* *Journal for Solid Waste Technology and Management*, Vol.29, No.1, February 2003

- Chang, S. & Nishat, S. (2005). *“Integrated Solid Waste Management for the City of Greensboro, NC: A Linear Programming Model”* Journal for Solid Waste Technology and Management, Vol.31, No.4, November 2005
- Cooper, J. (1999). *Clay’s Handbook of Environmental Health (18<sup>th</sup> Edition)*, Suffolk: St. Edmundsburg.
- Cunningham, W. & Saigo, B. (1990). *Environmental Science: A Global Concern*, Dubuque; WC.Brown.
- Department of Environmental Affairs and Development Planning (DEA & DP). (2005). *Towards a Sustainable Development Implementation Plan for the Western Cape: Concept paper on Sustainable Development*.
- Department of Environmental Affairs (1998). *Draft White Paper on Integrated Pollution And Waste Management in South Africa*, Department of Environmental Affairs.
- Diaz, L.F. & Savage, G. (1994). *Resource Recovery from Municipal Solid Waste in “WASTECON 94: All Africa Congress on Waste Management in Africa”* (pp.12-36).
- Di Maria, F. & Saetta, S. (2004). *”Life Cycle Assessment for Municipal Solid Waste Management Improvements-The Case of a 100,000 Inhabitant Italian Town”* Journal for Solid Waste Technology and Management, Vol.30, No.1, 2004
- Du Plessis, H & Gophe, M (2002). *“Side by side across the City’s Great Divide.”* The Cape Argus, 22 February: 3
- Everett, J.W. (2003). *“Using Surveys to Understand Curbside Recycling Programs”* Journal for Solid Waste Technology and Management, Vol.29, No.3, 2003
- Fuggle, R.F & Rabie, M.A. (1992). *Environmental Management in South Africa*, Cape Town: Juta
- Hiemstra, V.G. (1953). *“The Group Areas Act”*, Cape Town: Rustica Press.
- Internet: <http://www.aboutcapetown.com/maps.htm-online> 13/11/2006  
<http://www.capetown.gov.za>- online 08/11/04  
<http://www.cmc.gov.co.za/peh/soe/issues.htm> - online 22/ 02/01  
<http://www.cmc.gov.za> –online 22/02/01  
<http://www.cmc.gov.za/peh/soe/waste> -online 31/03/2003  
[http://www.cmc.gov.za/peh/soe/waste\\_2htm](http://www.cmc.gov.za/peh/soe/waste_2htm) – online 22/09/04)  
<http://www.cmc.gov.za> – online 08/11/04  
<http://www2.dpi.qld.gov.au/health/3579.html> - online 20/02/06
- Mbuligwe, S.E, Kaseva, M.E. and Kassenga, G.R. (2003). *“Methodology and Findings of a Solid Waste Quantification and Characterisation Study in Dar es Salaam City, Tanzania”* Journal for Solid Waste Technology and Management, Vol.29, No.3, August 2003

- McKinney, M.L. & Schock, R.M. (1998). *Environmental Science: Systems and Solutions*, New York, Jones and Bartlett .
- Morrisey, A. (2004). "A Methodology for Community Based Waste Management Decisions" *Journal for Solid Waste Technology and Management*, Vol.30, No.3, August 2004
- Nebel, B.J & Wright, R.T. (1996). *Environmental Science: The Way the World Works*, New Jersey: Prentice Hall.
- Neuman, W. L. (2000). *Social Research Methods: Qualitative and Quantitative Approaches*, 4<sup>th</sup> Edition, Boston. Allyn and Bacon.
- Pacione, M. (2001). *Urban Geography: A Global Perspective*, London: Routledge Taylor and Francis.
- Phillips, P.S, Morris, J. and Woolridge, (2005). A. "The strategic Solid Waste Management Research Agenda in England (2004-2007)-Implications for Evidence Based Policy Formulation in Developing Economies" *Journal for Solid Waste Technology and Management*, Vol.31, No.1.
- Sefe, F.T.K. (2000). *Pollution Control and Waste Management in Developing Countries: The Role of EIA in Waste Disposal and Management*. Commonwealth Secretariate, London.
- Sindane, J. (Undated). *Public Partnership Case Study: Waste Management in Khayelitsha and Thokoza. National Business Initiative*.
- Sivramkrishna, S. (2003). "The Urban Solid Waste Management Problem in India- An Economic Approach and Framework for Policy" *Journal for Solid Waste Technology and Management*, Vol.29, No.1, February 2003
- South Africa (Republic) (2001): *Census Data*
- South Africa (Republic), (1996). *The Constitution of the Republic of South Africa (Act 108 of 1996* Government Printers, Pretoria.
- Sylvester, E . (2001). "R1 million up for Grabs for Good, Clean, Fresh\_City." *The Cape Argus*, 06 June: 7.
- Tyler Miller, G. (1998). *Living in the Environment*, California: Wadsworth
- Viana, E. and Schulz, H.E. (2003). "Collection, Processing and Characterisation of Food Residue from Residential Waste for Use in Broiler Chicken Feed" *Journal for Solid Waste Technology and Management*, Vol.29, No.1, 2003
- Vu H. Q, (1994). "The Law of treaties and the export of hazardous waste" *12 UCLA Journal of Environmental Law and Policy* 389

Water Research Commission, (1996). *Evaluation of Solid Waste Practice in Developing Urban Areas in South Africa. Report No. 692/1/96*

Yeld, J, (2002). “CSIR fired up by ‘Green Power’” Cape Argus, 22 February: 5

Závodská, A. (2003). “A Study on Residential Solid Waste Composition and Management in a Selected developing country-Guyana” *Journal for Solid Waste Technology and Management*, Vol.29, No.1.



## Addendum 1

Response needed on the following issues in relation to: *A Comparative Study of the Solid Waste Disposal Practices and Management in the Breede River District Council and the Cape Metropolitan Areas.*

(Amanda Frantz)

### DISPOSAL ISSUES

What final disposal method is used (landfilling, incineration, others)?

Is the collected waste taken to transfer stations or straight to landfills/incinerators?

Where is it located?

Nature of operations?

- Size / capacity of facility
- Methods used
- Source(s)/ waste generation areas
- Areas serviced by the respective municipalities
- Volumes handled (tonnage per day/week/month)
- Content of volumes normally handled (mixed or separated waste)
- General monitoring & management
- Municipal regulations
- Hygiene/standards
- Access (for public) to facility (landfill site)
- Operating times
- Future developments/perspectives



### WASTE GENERATION & MUNICIPAL MANAGERIAL ISSUES

- Profile of municipal departments/section responsible for waste disposal & management
- Capacity of containers (for household, business, industries, other,)?
- Average waste generation statistics for each of the categories above
- Frequency and days of collection(truck routes, size, management)?
- Is recycling practiced? (What, where, how?)
- Is medical and toxic waste the municipality's responsibility?
- Use of private contractors? (Who, what, how, when?)
- Disposal of medical & toxic waste (volumes, facilities/where, frequencies, monitoring?)

## Addendum 2



Dear Respondent

The purpose of this questionnaire is to assist Amanda Frantz, a post graduate student in the Department of Geography and Environmental Studies at the University of the Western Cape with her research on Waste Management, specifically, the disposal and management of solid waste in the Breede River District and the Cape Metropolitan Area (CMA).

It will be appreciated if you can complete the attached questionnaire by answering all the questions to the best of your ability.

The information will be treated confidentially and will only be used for academic purposes and in so far as it can contribute to solid waste management.



Thank you for your co-operation.


Geagte respondent

Die doel van hierdie vraelys is om Amanda Frantz, 'n nagraadse student in die Departement Geografie en Omgewingstudies aan die Universiteit van Wes Kaapland, te help met haar navorsing in Afvalbestuur, spesifiek die bestuur van soliede afval in die Breede Rivier Distrik en die Kaapse Metropolitaanse gebied. Dit sal waardeur word indien u die volgende vrae na die beste van u vermoë kan beantwoord.

Die inligting sal met konfidensialiteit hanteer word en sal alleenlik vir akademiese doeleindes gebruik word en sover dit 'n bydrae tot afvalbestuur kan lewer.

By voorbaat dank vir u samewerking.

**A. DEMOGRAPHICS /DEMOGRAFIE**

1. Town/Dorp: .....
2. Suburb/Voorstad/Area:.....
3. Address/Adres:  
.....
  
4. Name of respondent/Naam van respondent:.....
5. Sex/Geslag: Male/Manlik   
Female/Vroulik
  
6. Age/Ouderdom:.....
  
7. Marital Status/Huweliksstatus: Married/Getroud   
Unmarried/Ongetroud   
Divorced/Geskei
  
8. Who is the breadwinner/owner/household manager of this household?  
Wie is die broodwinner/eienaar/bestuurder in die huishouding?  
.....  
.....
  
9. What is your income per month?  
Wat is u maandelikse inkomste?  
  
R 800-1000   
R1000-1500   
R1500-2000   
R2000 or more
  
10. What is your highest educational qualification?  
Wat is u hoogste opvoedkundige kwalifikasie?  
.....
  
11. What is your occupation?  
Wat is u beroep?  
.....
  
12. How many people live in your household?  
Hoeveel mense woon in die huis?  
.....
  
13. How long have you been living here?  
Hoe lank is u hier woonagtig?



.....  
14.If not all your life, where did you live before?  
Indien nie altyd hier woonagtig, waar het u voorheen gewoon?  
.....  
.....

**B. WASTE DISPOSAL ISSUES/ASPEKTE T.O.V AFVALVERWYDERING**

15.How frequently is your waste collected?  
Hoe dikwels word u afval gekollekteer?

once a week/eenmaal per week

twice a week/twee maal per week

once every second week/een maal elke tweede week

other/ander

16. What types of waste do you dispose of?  
Watter tipe afval gooi u weg?



.....  
.....

17. What type of container is used for the waste? (plastic bins, black bags, etc.)  
Watter tipe houer word gebruik vir afval? (plastiek blikke, swart sake, ens.)

.....

18. Is waste separated at home?  
Word afval by die huis gesorteer?

Yes/Ja  No/Nee

19. Motivate your answer in 18.  
Motiveer U antwoord in 18.

.....  
.....

20.What to your understanding is a landfill site? (Explain)  
Wat volgens u is 'n stortingssterrein? (Verduidelik)

.....

.....  
21. What to your understanding is an incinerator? (Explain)  
Wat volgens u is 'n verbrandingsoond? (Verduidelik)

.....  
.....  
22. Where is your waste taken after collection?  
Waar word u afval geneem na insameling?

.....  
23. Do you make use of the waste disposal facility otherwise?  
Maak u andersins gebruik van die afval stortingsterrein/fasiliteit?

.....  
24. What is done with waste that is not ready for collection on specified days?  
Wat maak u met afval wat nie gereed is vir kolleksie op gespesifiseerde dae nie?



25. Do you use the landfill site or dumpsite to dispose garden refuse?  
Maak u gebruik van die afval of stortingsterrein om tuinvullis te stort?

Yes/Ja  No/Nee

26. If yes, at what times?  
Indien ja, wanneer?

.....  
27. How often?/Hoe dikwels?

.....  
28. Are you involved in recycling and re - use?  
Is u betrokke by herwinning en hergebruik?

.....  
**C. MANAGERIAL ISSUES/ ASPEKTE T.O.V AFVALBESTUUR**

29. Are you aware that some of the municipalities will merge?  
Is u bewus van die samesmelting van die munisipaliteite?

Yes  No

30. If yes, do you think that it will affect waste management in any way? (Explain)  
Indien ja, dink u dat dit die bestuur van afval enigsins sal beïnvloed?(Verduidelik)

.....  
.....  
.....

31. Are you satisfied with the waste disposal services rendered by your municipality at the moment?(Explain)  
Is u tevrede met die dienste wat gelewer word deur u munisipaliteit op die oomblik? (Verduidelik)

.....  
.....

32. Any additional comments/suggestions/critique?  
Enige addisionele kommentaar/voorstelle/kritiek?

.....  
.....  


33. Are you satisfied with the following waste management services:  
Is u tevrede met die volgende afvalbestuur dienste:

(a) frequency or days of collection/ frekwensie of dae van kolleksie

Yes/Ja  No/Nee

(b) Motivate your answer in (a)  
Motiveer u antwoord in(a)

.....  
.....

(c) times of collection  
tye van kolleksie

Yes/Ja /Nee

(d) Motivate your answer in (c)  
Motiveer u antwoord in (c)

.....  
.....

(e) Waste collectors on trucks  
Werkers op trokke

Yes/Ja  No/Nee

(f) Motivate your answer in (e)  
Motiveer u antwoord in (e)

.....  
.....

(g) Monthly municipal waste payment  
Maandelikse betaling vir afval verwydering

Yes/Ja  No/Nee

(h) Motivate your answer in (g)  
Motiveer u antwoord in (g)

.....  
.....



(i) Payment for removal of additional waste (eg. garden refuse)  
Betaling vir verwydering van addisionele afval( bv. tuinafval)

Yes/Ja  No/Nee

(j) Motivate your answer in (i)  
Motiveer u antwoord in (i)

.....  
.....

**THANK YOU FOR YOUR CO-OPERATION/DANKIE VIR U  
SAMEWERKING**

### Addendum 3-Additional Tables

Gender	Frequency	Percentage
Male	7	28.0%
Female	18	72.0%
<b>Total</b>	<b>25</b>	<b>100.0%</b>

*Table A 1: Gender distribution in Worcester*

	Frequency
Privately owned houses	14
Municipal houses (Coloured population)	14
Municipal houses (Black population)	14
Municipal-built flats	4
Informal settlement	4
<b>Total</b>	<b>50</b>

*Table A 2: Distribution of housing types in the BRD*

Population Type	Worcester	Zwelethemba	Robertson	Nkqubela
African/Black	2,384 (3.6%)	14,890 (98.5%)	1,221(6.7%)	2,862 (87.8%)
Coloured	49,127 (74%)	229 (1.5%)	13,295 (72.5%)	392 (12%)
Indian	439 (0.7%)	3 (0.0%)	39 (0.2%)	-
White	14,395 (21.7%)	3 (0.0%)	3,780 (20.6%)	6 (0.2%)
<b>Total</b>	<b>66,345</b>	<b>15,124</b>	<b>18,335</b>	<b>3,260</b>

*Table A 3: Population distribution by race in the BRD*

*Source: Census 2001*

Gender	Worcester	Zwelethemba	Robertson	Nkqubela
Male	21,475 (48.3%)	4,529 (46.1%)	5,647 (48%)	1,1045 (48.4%)
Female	22,951 (51.7%)	5,287 (53.9%)	6,106 (52%)	1,114 (51.6%)
<b>Total</b>	<b>44,425</b>	<b>9,816</b>	<b>11,752</b>	<b>2,158</b>

*Table A 4: Gender distribution*

*Source: Census 2001*

	Frequency	Percentage
Married	33	66%
Unmarried	12	24%
Divorced	4	8%
Widowed	1	2%
<b>Total</b>	<b>50</b>	<b>100%</b>

*Table A 5: Marital status in the BRD*

---

