

**SOLID WASTE MANAGEMENT IN LOW AND HIGH INCOME RESIDENTIAL  
AREAS OF MASERU: A COMPARATIVE STUDY OF MASERU WEST AND SEA-  
POINT**

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## ABSTRACT

Waste management has received very little attention in Lesotho's Development Planning. Lack of environmental policy and environmental framework law has resulted in waste being illegally dumped. Inadequate services in the country, coupled with increasing population in the urban areas due to rural-urban migration, has led to litter being a serious environmental problem in the whole country, especially in the urban areas.

This study aims to analyse the defects of the waste management strategies in Maseru by investigating the waste management systems employed in two residential areas of different income levels. In addition, this thesis attempts to evaluate the impact of socio-economic and educational factors on solid waste management practices in Maseru. An investigation into trends or similarities in the services rendered by the Maseru City Council was carried out and compared with the literature reviewed.

A survey was conducted as two case studies, mainly to assess the present coverage and the standard of refuse generation, collection and disposal service. Waste was collected from the two study areas and compared in terms of the type and amount of waste generated.

The major factors influencing waste generation were found to be the gender and educational level of the household head, income level of the household and the household size. These were found to be proportional to waste generation and inter-related. In this regard, that families headed by men were found to have higher incomes than those headed by women and were found to produce more waste. Furthermore, in households where the household head had attained a higher level of education, income levels increased, there was a concomitant increase in waste generation. In general, high income residential areas generated more waste than low income residential areas. Large families use more money and consume more food than small families, thus generate more waste.



The major component of waste was largely paper and plastic, but glass, cans and organic materials were also recorded. In general, waste management in Maseru (Lesotho) was found to be very poor because of lack of policy and contradicting and scattered sectoral laws dealing with waste management, lack of urban planning and infrastructure. More importantly, waive of laws relating to waste has resulted in land degradation due to illegal dumping and littering.

## PREFACE

The intention of this study is to compare and analyse solid waste generation in the low and high income residential areas of Maseru. This is done in order to contribute to improved waste management in the country.

This thesis consists of five chapters. The first chapter introduces terms, strategies and context employed in the study. This chapter also explains waste management strategies. It lays down the background information for Lesotho, the country where study areas are located, after which it presents the state of policies and institutions related to waste management.

The second chapter outlines the methodology utilised on the study. It presents the aim of the study and the objectives to be achieved at the end of the study. It then puts forward the hypotheses made before the study was conducted. This chapter also gives the description of the two study areas, the rationale for choosing them. Furthermore, it presents the methods which were adopted during data collection. Finally, it puts forward the problems encountered during the survey.

The third chapter presents the literature as reviewed in Lesotho and other southern African countries such as South Africa (the neighbouring country), Zimbabwe and Zambia. The problems associated with solid waste management were also tackled in this chapter and finally waste minimisation strategies are discussed.

The fourth chapter comprises the results as they were found during the survey and the analyses thereof. The final chapter gives a general observation made during the study and presents a way forward in order to achieve sustainable waste management in Maseru and Lesotho as a whole.

Signed: \_\_\_\_\_

Aholoholo

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## TABLE OF CONTENTS

ABSTRACT .....	i
PREFACE .....	iii
ACKNOWLEDGEMENTS .....	iv
TABLE OF CONTENTS .....	v
LIST OF ABBREVIATION AND ACRONYMS .....	viii
LIST OF FIGURES .....	ix
LIST OF PLATES .....	x
LIST OF TABLES .....	xi
CHAPTER 1 .....	1
INTRODUCTION TO TERMS, STRATEGIES AND CONTEXT .....	1
1.1 Introduction .....	1
1.2 Working Definitions Employed by the study .....	2
1.2.1 Waste .....	2
1.2.2 Hazardous Waste .....	3
1.3 Waste Management Strategies .....	4
1.3.1 Generation .....	4
1.3.2 Storage .....	5
1.3.3 Collection .....	5
1.3.4 Processing .....	5
1.3.5 Disposal .....	6
1.3.5.1 Sanitary Landfill .....	6
1.3.5.2 Incineration .....	7
1.4 Lesotho Background Information .....	7
1.4.1 Location .....	7
1.4.2 State of Policies and Institutions Related to Waste Management .....	10
CHAPTER 2 .....	15
2. METHODOLOGY .....	15
2.1 Introduction .....	15
2.2 Aims and objectives .....	15
2.2.1 Aim .....	15
2.2.2 Objectives .....	15
2.3 The Study Areas .....	16
2.3.1 Maseru West .....	17
2.3.2 Sea-Point .....	18

2.4 Data Source .....	21
2.4.1 Literature Review .....	21
2.4.2 Oral Interview .....	21
2.4.3 Household Survey .....	22
2.4.4 Field Inspection .....	23
CHAPTER 3 .....	24
3. LITERATURE REVIEW .....	24
3.1 Introduction .....	24
3.2 Waste Management .....	25
3.2.1 Key Concepts: Generation, Collection and Disposal .....	26
3.2.1.1 Waste Management in South Africa .....	29
3.2.1.2 Waste Management in Zimbabwe .....	30
3.2.1.3 Waste Management in Zambia .....	31
3.2.1.4 Waste Management in Lesotho .....	32
3.3 Problems of Waste Management in Southern Africa .....	43
3.4 Environmental Problems of Waste in Southern Africa .....	44
3.5 Waste Minimisation Strategies .....	44
3.5.1 Reducing Waste .....	45
3.5.2 Re-use of Materials .....	45
3.5.3 Recycling of Materials .....	45
3.6 Conclusion .....	47
CHAPTER 4 .....	48
4. RESULTS AND DISCUSSION OF THE STUDY. ....	48
4.1 Results .....	48
4.1.1 Gender of the Household Head .....	48
4.1.2 Education Level .....	49
4.1.3 Income Level of the Household .....	51
4.1.4 Household Size .....	55
4.1.5 Waste Generation .....	57
4.1.6 Waste Collection and Disposal .....	59
4.2 Interviews .....	63
4.2.1 Maseru City Council .....	64
4.2.2 National Environment Secretariat .....	65
4.3 Field Inspection .....	66
4.4 Discussion .....	68
CHAPTER 5 .....	70
5. CONCLUSION AND RECOMMENDATIONS .....	70
5.1 Limitations of the Study .....	70
5.2 Conclusion. ....	70
5.3 Recommendations .....	72
REFERENCES .....	76
APPENDIX .....	78

## LIST OF ABBREVIATION AND ACRONYMS

CBD	Convention on Biodiversity,
CCC	Convention on Climate Change
CCD	Convention to Control Desertification.
COWMAN	Committee on Waste Management
CTA	Chief Technical Advisor
DANCED	Danish Cooperation for Environment and Development
DEH	Director of Environmental Health
DSW	Durban Solid Waste
EIA	Environmental Impact Assessment
LEA	Lesotho Environment Authority
LHDC	Lesotho Housing Development Corporation
LNDC	Lesotho National Development Corporation
MCC	Maseru City Council
NAP	National Action Plan
NEAP	National Environment Action Plan
NGO	Non-Governmental Organisations
NES	National Environment Secretariat
NEYC	National Environment Youth Corps
NUL	National University of Lesotho
SEHO	Senior Environment Health Officer
SOE	State of Environment
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNV	United Nations Volunteer
WASA	Water and Sewage Authority
WWSPR	Welcome Waste Sorting Plant and Recycling

**LIST OF FIGURES**

Figure. 1.1. The Administrative District Map of Lesotho .....	9
Figure 2.1. Location of Study Area .....	20
Figure 3.1. Functional Elements in Waste Management Process (Tchobanoglous <i>et. al.</i> , 1977: in Mayet, 1993). .....	26
Figure 3.2. Location of the Disposal Site .....	42
Figure 4.1. Types and Amounts of Recyclable Waste Generated in Kilograms per Week .....	58

**LIST OF PLATES**

Plate 4.1. A section of Maseru West .....	62
Plate 4.2. A Section of Sea-Point .....	63
Plate 4.3. <i>Tsosane</i> Disposal Site .....	67



## LIST OF TABLES

Table 2.1: Estimated Refuse Collection Service Coverage by Wards - Maseru City Council (1990) .....	19
Table 3.1: Waste Generation Rates in Selected Industrial and Low Income Cities .....	28
Table 3.2: Participation in Parliamentary Assembly .....	40
Table 3.3: Participation in the Policy Making Level of Government .....	40
Table 4.1: Gender of Household Head .....	48
Table 4.2: Level of Education of the Household Head .....	50
Table 4.3: Total Income per Household per Month .....	52
Table 4.4: Household Dependency Ratio .....	54
Table 4.5: Household Cash Available <i>Per Capita</i> .....	55
Table 4.6: Household Size .....	56
Table 4.7: Summary of Weekly and Annual Waste Generation in Kilograms .....	59
Table 4.8 Frequency of Waste Collection .....	60
Table 4.9: Methods of Waste Disposal in the Study Areas .....	60

## CHAPTER 1

### 1. INTRODUCTION TO TERMS, STRATEGIES AND CONTEXT

#### 1.1 Introduction

In recent years, man has become increasingly aware of his environment and the effects he has upon it. The depletion of natural resources and the pollution of air, land and water have received considerable attention lately as evidence of this cause for concern. Developing as well as rapidly industrialising regions are faced with rapidly increasing populations as a result of high birth rates and immigration (UNEP, 1997). These regions are battling with the accompanying environmental problems of unplanned urban growth and emerging mega cities. An equally important aspect of man's effect on the environment is the waste that he generates and the methods that he uses to dispose it. Poor waste management, particularly in African cities, is a problem in view of its potential negative effects on human health.

In light of the above, this thesis aims to investigate waste management strategies in Lesotho by reviewing waste management practices in low and high income residential areas of Maseru with a case study of Maseru West and Sea-Point. It aims to assess and analyse the generation, collection, transportation and disposal of waste in the two study areas. The intention is to generate recommendations which will improve waste management in Lesotho. Because of lack of environmental laws controlling waste disposal and pollution in Lesotho, urban waste has been disposed of indiscriminately. This has been exacerbated by the high rate of urban population growth and rapidly increasing industrialisation, coupled with lack of planning and infrastructure such as roads for transporting waste from the source to the disposal site.

## 1.2 Working Definitions Employed by the study

The following terms and expressions relevant to the study are defined and discussed as a point of departure:

- waste
- hazardous waste
- waste management strategies

### 1.2.1 Waste

Waste is defined differently by different people and is easier to recognise than to define. For example, in South Africa's law, waste is defined as:

*"...any matter, whether gaseous, liquid or solid or any combination of these states, originating from any residential, commercial or industrial area or agricultural area identified by the Minister of Environment Affairs as an undesirable or superfluous by-product, emission, residue or remainder of any process or activity"* (Fuggle and Rabie, 1996, p. 512).

In Lesotho's law, waste is defined as:

*"...any substance that may be prescribed as waste or any matter, whether liquid, solid, gaseous, or radio-active, which is discharged, emitted or disposed in the environment in such a volume, composition or manner as to cause an alteration of the environment (NES-LEA, 1997a, p. 4).*

Waste maybe described differently but the overall meaning is that waste is any substance which the owner no longer finds useful and needs to disposed.

### 1.2.2 Hazardous Waste

Waste can be classified as hazardous or non-hazardous. The South African legal definition for hazardous waste complies with that of the United Nations Environment Programme :

*“...an in-organic or organic element or compound that, because of its toxicology, physical, chemical or persistency properties may exercise detrimental acute or chronic impacts on human health and the environment”* (Department of Water Affairs and Forestry, 1994, p.11).

In Lesotho’s law, hazardous waste is defined as:

*“...waste which is poisonous, corrosive, noxious, explosive, inflammable, radioactive, toxic or harmful to the environment”* (NES-LEA,1997a, p. 4).

It should be noted that most materials which would not be classified as “hazardous” can readily give rise to health hazards. For example, municipal waste placed in a landfill site may not only constitute direct health hazards as a result of dust, smells, vermin and flies in poorly managed sites, but also the action of water infiltrating and percolating through the waste gives rise to leachate and gas which may cause additional health problems.

Gerrans (1994) postulates that although the amount of hazardous waste produced per household is less than that produced by many industrial companies, the combined effect of millions of households is contributing to the generation of significant amounts of hazardous waste. He assumes that almost every household contains materials which could become hazardous waste if they are not correctly disposed of. He gives the following example: adhesives, alcoholic drinks, antifreeze solutions, batteries, bleaches, carpet cleaners, compressed-gas cylinders, detergents, disinfectants, flea powders, insecticides, and polishes.

### 1.3 Waste Management Strategies

Altaf and Deshazo (1996) believe that most municipalities in developing countries spend a large proportion of their budgets on collection, transportation and disposal of solid waste. They support their opinions using Cointreau (1994, p.41-44):

*“...in most cities in developing countries, municipal solid waste management costs consume 20-50% of municipal revenue, yet collection service levels remain low with only 50-70% of residents receiving service and most disposal unsafe”.*

The observations of Altaf and Deshazo (1996), however, differ from that of Booth's *et al.* (1994) because the latter believes that the standard of waste disposal throughout the southern African region is poor due to high disposal costs rather than collection costs.

The following are waste management strategies as described by Mayet (1993):

#### 1.3.1 Generation

It is important to know the volume and type of waste generated before one can plan appropriate management strategies. Generation of waste means knowledge of the source of waste. The main sources of waste are in urban areas and major areas of developments. According to Johnson and Chenje (1996) the following sources are considered serious: industrial and municipal waste (both solid and liquid), biodegradable waste and non-biodegradable, agro-chemicals (pesticides, herbicides or fertilisers), and mining waste. It is therefore important in this study to know the main sources of waste in the urban areas of Lesotho.

### **1.3.2 Storage**

Storage means the initial accumulation of waste at the site of generation in order for collection and disposal to be accomplished. Clayton and Huie (1973) observed that in areas of high population concentration, the distances between generation sites have to be short to permit on-site storage. The authors also observed that, with the increased distances between generation sites, it often becomes more economical to consider the collection of waste from one or more common collection points.

### **1.3.3 Collection**

The collection process includes the removal and transportation of wastes from the source to the disposal site. This activity is often quite expensive as it involves several pieces of equipment and large numbers of personnel. It is likely that the productivity of each collection vehicle and its crew is dependent upon the amount of time spent in transit. The distance between the origin of wastes and a disposal site, as reflected in the collection cost is a primary determinant of the choice of a disposal site/ method of disposal (Clayton and Huie, 1973).

### **1.3.4 Processing**

The aim of solid waste disposal process is to reduce the volume of the refuse, so that it can be disposed of more readily, and to convert it to a less offensive form. One of the steps in processing is separating recyclables from the waste and making compost from the organic waste component. It also involves compacting waste before and after disposal.

### **1.3.5 Disposal**

This refers to the destruction and/or final deposition of wastes. With present technology, several disposal alternatives are feasible from an engineering standpoint. According to literature, the most commonly used methods are the sanitary landfill and incineration (Clayton and Huie, 1973). The authors consider the sanitary landfill as presently the only true disposal method and as basic to any solid wastes programme, while incineration is only a volume reduction process, producing residues which can be sanitary landfilled. In general, The authors consider the sanitary landfill on the whole, as the most economical of the relevant disposal alternatives.

#### **1.3.5.1 Sanitary Landfill**

A sanitary landfill is a carefully and scientifically selected, designed, engineered and managed waste disposal site. Sanitary landfills are usually situated in valleys or disused quarries. In sanitary landfills, waste is reduced by spreading it in thin layers, and compacting it using bull-dozers or landfill compactors before the next load is dumped. When a certain level is reached, the refuse is covered with a thin layer of clean earth which is also compacted. The operation is repeated until the landfill has reached the desired height. In this way, incidences of wind scatter of refuse, odours, flies or rats and fires are greatly reduced. When full, landfill sites are grassed to prevent soil erosion and the area becomes available for reuse.

Sanitary landfills are not without their own problems. Anaerobic decomposition of waste produces gaseous substances, notably methane, which diffuses into the atmosphere. Another problem is leachate, a poisonous substance which is formed when chemicals from the waste are mixed with rain water. Leachate percolates to the bottom of the landfill and can eventually enter ground water, contaminating wells, rivers and lakes.

### 1.3.5.2 Incineration

Incineration is a controlled combustion of waste materials to reduce them to a non-combustible residue or ash and exhaust gases, i.e., carbon dioxide and water. It is a preferred means of disposal for most domestic, medical and industrial hazardous wastes. It is also considered most effective method of reducing waste volume as only 30 to 40 per cent of the bulk remains for disposal (Clayton and Huie, 1973). This process, however, involves use of high-cost technology. It is therefore not one of the methods readily used for waste disposal. It can also release toxic gases like sulphur dioxide and carbon monoxide into the air.

## 1.4 Lesotho Background Information

Lesotho, like many other developing countries, is faced with many environmental problems. Rapid population growth and unplanned urbanisation have resulted in localised over-population in Maseru and over-exploitation of the natural resources such as land. It is increasingly faced with problems associated with waste management specifically solid waste. Waste management in Lesotho has received little attention in the history of development planning as there has been no comprehensive environmental code. The government has not given the necessary attention to waste management and the situation has grown out of proportion as a result of neglect and it is now costly to manage. Although, there are suitable landfills for waste disposal in the entire country, unused quarries are being used officially as disposal sites. Regardless of the presence of these disposal sites, waste materials are being dumped unsafely in open spaces, rivers, dongas, etc. or sometimes burned within the city, resulting in air pollution.

### 1.4.1 Location

Lesotho is a mountainous country covering an area of 30 355 square kilometre located between latitudes 28 and 31 degrees South and longitudes 27 and 30 degrees East (Lesotho Government, 1994). It is completely surrounded by the Republic of South



Africa. Lesotho is divided into ten districts of which Maseru district contains Maseru City which is the capital city (Fig. 1.1). According to the Lesotho Government (1994), Basotho are still largely a rural people, with 84% living in rural villages. According to this report, rapid urbanisation is taking place, with the growth rate of Maseru City estimated at between 7% and 11% per year. According to the Bureau of Statistics (1997) data on village lists, Greater Maseru has a total population of 385 869, of which 36% is urban and the rest is peri-urban and rural. The 1996 census revealed that the population of Lesotho is 1 841 967 and the growth rate is approximately 3 %.

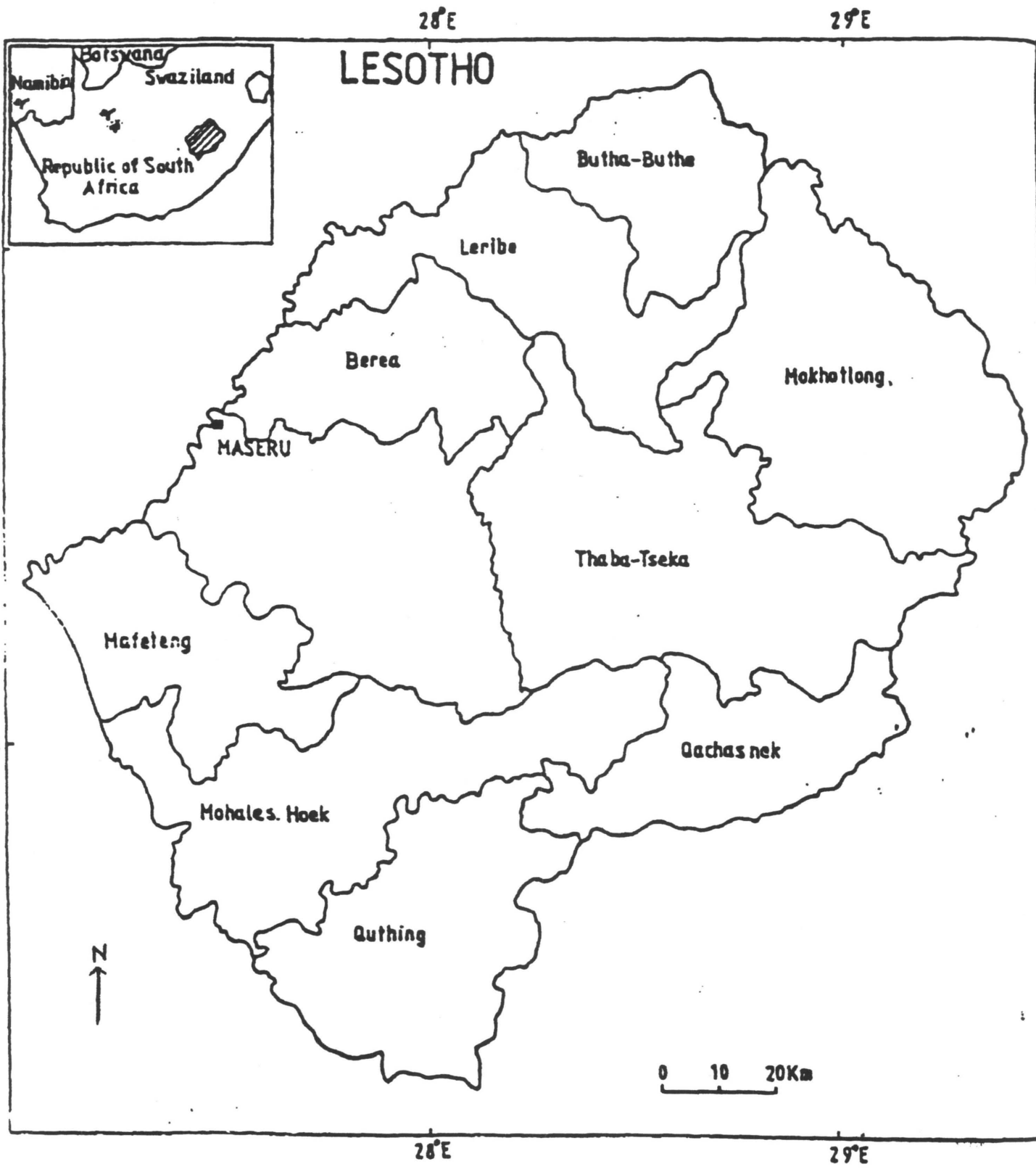


Figure 1.1. Administrative District Map of Lesotho

#### 1.4.2 State of Policies and Institutions Related to Waste Management

The study's focus is mainly on municipal waste, particularly domestic waste. Municipal refuse according to Clayton and Huie (1973) includes domestic, commercial, institutional, industrial and street litter. For the purposes of this study, however, only domestic solid waste is considered. Solid waste in this study is defined as the non-gaseous and non-liquid wastes that result from the daily activities of a community's residential population.

A number of southern African countries have developed National Environment Action Plans (NEAPs), with the aim of improving environmental management through regulatory and educational instruments. In Botswana, there is an ongoing study on waste management and protection of water resources which seeks to identify and plan for waste disposal sites with an impact on water resources (Booth *et al*, 1994). Similarly, the government of Lesotho has recognised the need for sound environmental management and protection as is evidenced by the adoption of the National Environmental Action Plan (NEAP) in 1989 and the establishment of National Environment Secretariat (NES) in 1994.

A NEAP identified a set of environmental problems that were attributed to inadequate planning of urban development. These included careless disposal of waste, industrial pollution due to industrial waste and inadequate sanitation. These problems have been exacerbated by lack of adequate policies and regulations on waste disposal in Lesotho (NES, 1997a). The lack of adequate policies and regulations and enforcement of laws has limited the effective implementation of NEAP process.

The main objective of NEAP was to increase awareness about environmental problems in sectoral planning and programming. In May 1994, the National Action Plan (NAP) was established in Lesotho to implement Agenda 21 which, according to Nicholas (1993), is a principal outcome of the United Nations Conference on Environment and Development (UNCED) in 1992. Agenda 21 is an action plan for the 1990s and beyond,

adopted by the international community. It presents a set of integrated strategies and detailed programmes to stop and reverse the effects of environmental degradation and to promote environmentally sound and sustainable development in all countries (Nicholas, 1993). At present, only a draft of Lesotho's Agenda 21 is available. NAP was to build on the foundations of NEAP and would incorporate sectoral priorities and national plans for implementing international conventions on Biodiversity (CBD), Climate Change (CCC) and to Control Desertification (CCD) (NES-LEA, 1997b).

According to NES (1997b), the government of Lesotho, in collaboration with the United Nations Development Programme (UNDP), established the National Environment Secretariat in the office of the Prime Minister in April 1994. NES co-ordinates activities that affect the environmental resources of Lesotho, also co-ordinates and oversees the implementation of the National Environment Action Plan (NEAP) adopted in 1989. It works with various stakeholders such as government ministries, private sectors, non-governmental organisations (NGOs) and local communities. It has formulated an environmental policy which was enacted by Lesotho parliament in 1996 and has drafted the environmental framework law for Lesotho which will be tabled in parliament in the near future. In addition, NES has formulated a draft for Agenda 21 for Lesotho, guidelines for Environmental Impact Assessment, co-ordinated the establishment of the State of Environment Report for Lesotho and has commissioned a baseline survey for waste management in Lesotho through the National Environment Youth Corps (NEYC).

According to Sibanda (1997), NES established the National Environment Youth Corps (NEYC) in 1996 under its umbrella in order for it to carry out some aspects of its mandate. The Youth Corps is a joint United Nations Development Programme (UNDP) and the government of Lesotho project with the following objectives:

1. To design and implement systemic environmental rehabilitation.
2. To provide training and employment for unemployed youth.
3. To equip the youth with skills for environmental management and rehabilitation.

The NEYC project has been active in many different environmentally-friendly projects since its establishment. The project works in two phases of which phase 1 is for rural land rehabilitation and phase 2 is for urban clean-up and recycling. At the end of 1997, there were about 1105 youngsters working with the project in both phases, mainly in rural areas. About 10% of these youth involved had no formal education. At the end of 1997, the project was operational in seven districts of the country in phase 1, (*Mohales'hoek, Mafeteng, Berea, Quthing, Qachas'nek, Thaba-Tseka and Leribe*) and five towns in phase 2, (*Mohales'hoek, Mafeteng, Maseru, Berea and Maputsoe*). The intention of the project is to cover all the ten districts of Lesotho (Fig.1.1.)

In the rural land rehabilitation project, 47 local/village nurseries were established in seven districts at the end of 1997. The seedlings from these nurseries are to be transplanted in the villages as an effort to introduce vegetation onto barren land and halt the rampant soil erosion. In addition, the youth corps has rehabilitated gullies and roads as well as assisted in contouring and field boundary demarcation.

The baseline survey commissioned by NES/NEYC shows that Lesotho generates about 77000 tonnes of waste paper and 162 000 tons of plastic annually, of which, only 1.5% of paper and 0.6% of plastic were recovered for recycling before the establishment of NEYC project. As a result of the low recovery rate, NEYC has established an urban clean-up and recycling project in order to increase the recovery rate. The youth in this project clean up towns in Lesotho and at the same time, collect and separate recyclables for recycling. The intention of the project is to establish a recycling plants in Lesotho.

The National Environment Secretariat co-ordinates the Committee on Waste Management (COWMAN) whose primary objective is to create conditions for environmentally sound waste management systems. The membership of COWMAN is drawn from relevant line ministries, the Maseru City Council (MCC), the National University of Lesotho (NUL), Water and Sewerage Authority (WASA) and NGO's. One of the most important and outstanding activities undertaken by this Committee has been the auditing of the waste disposal site at *Ha Tsosane* and the identification of dumping sites in all districts of Lesotho.

The National Environment Secretariat is currently coordinating a “State of the Environment” (SOE) report. The main objective of the SOE report is to document, analyse and draw up indicators to monitor changes in Lesotho’s environment. It consists of the collective work of more than 30 leading scientists, academics, senior technical officers in government and environmentalists in the country. It examines the key aspects about the relationship between the environment and socio-economic conditions by considering the impacts of human activities on the environment and society’s response to reduce these pressures (Partow, in NES, 1997b).

In Maseru, like in many cities, the collection and disposal of waste is the responsibility of the City Council. The Maseru City Council was inaugurated in April 1989 under the Urban Government Act 1983, replacing the old Maseru Town Office (MCC, 1990). It is in charge of management and administration of the municipality, assistance in the maintenance of good order and government within its area, promoting public health, welfare and convenience, and the development, sanitation and amenities of the municipality and acts as a rating authority. There are 16 ward within The Maseru City Council’s jurisdiction, the sixteenth ward was added at the beginning of 1997. The council consists of 19 members of which 16 are elected from wards and 3 chiefs who are *ex-officio*-members since their wards extend into MCC’s area of jurisdiction. The wards are listed in Table 2.1.

Although Lesotho has similar problems to other southern African countries with regard to waste management, there are some which are peculiar to Lesotho. These are as follows:

- a) There is insufficient researched data at a detailed level on how much waste is presently being generated, on the potential capacity of disposal sites and on improvement of management of waste. The baseline study conducted in 1997 on “Waste Management in Lesotho” included only part of Maseru district, and projections were made for other districts using preliminary results of the 1996 population census.

- b) As a result of inadequate data, there are no suitable development models: This makes it difficult to predict the patterns of waste generation such that better use can be made of existing infrastructure and planning of waste management strategies.
  
- c) There are no adequate landfills in the country, largely as a result of spontaneous random settlements and poor community infrastructure. Most of the waste in the city of Maseru is dumped in open spaces, dongas and rivers because the city council's trucks cannot reach the places due to lack of road network to these unplanned areas (Rametse *pers. com* (1997)).

These problems, together with the high rates of population and urbanisation increase in Maseru, were the main motivation for this study. It is hoped that this study will contribute towards establishing waste management strategies in Lesotho and to provide a preliminary data to enable prediction for future waste generation.

## CHAPTER 2

### 2. METHODOLOGY

#### 2.1 Introduction

Maseru is the capital city of the Kingdom of Lesotho. It has been expanding without any form of planning and development control for many years. It is therefore essential to determine *per capita* waste generation rates since adequate waste generation rates are not known in Maseru and the entire country. Field research for this thesis involved a systematic survey of selected households with different income levels in Maseru. Plastic bags were provided for household waste collection and then weighed to find out the amount of waste produced. Questionnaires were used to gather information on people's perceptions. Householders were informed about the purpose of the survey so that they could fully co-operate.

#### 2.2 Aims and objectives

##### 2.2.1 Aim

The aim of the study is to evaluate impact of socio-economic and educational factors on solid waste management practices in Maseru by comparing two urban residential areas of different socio-economic status.

##### 2.2.2 Objectives

The main objectives of the study were:

- to compare the quality and quantity of waste generation in high and low income residential areas in Maseru.
- to find out the level of community perception on waste separation, re-use, recycling and composting.



- to investigate the employment prospects and income generation for the unemployed in the sphere of waste management.
- to investigate the fate of municipal waste that is being collected by the Maseru City Council.
- to analyse the disparities in the services offered by Maseru City Council.
- to assess and evaluate the sustainability of the existing disposal site in Maseru.
- to critically analyse the existing waste management strategy.
- to provide preliminary data for the prediction of waste generation in the future.

Based on these objectives, the following hypotheses were made:

- a) The gender of the household head affects the economic level of the household, e.g. single female headed household means a single income and hence a low income household.
- b) Waste generation depends on the level of both education and income of a household.
- c) Different classes of people generate different types of waste, e.g. low income households generate different types of waste from the high income households.
- d) The number of people in a household is directly proportional to the amount of waste produced.

### **2.3 The Study Areas**

The study focussed on waste management in two areas of different income levels, chosen on the following bases:

- Both areas should lie within the area of jurisdiction of Maseru City Council.
- Both areas should receive services from the MCC, because not all the wards within the municipality receive services, (reasons will be explained in chapter 4).

The study areas were identified using household income as a factor and the population density of the residential area. It is known in Maseru that Maseru West is a high income residential area because of its high level of income of its occupants and the low density, while Sea-Point is regarded as a low income residential area because of its low level of income of its residents and the high population density (Fig. 2.1.) Based on the total number of households per area, 60 households and 50 households were surveyed in Maseru West and Sea-Point, respectively.

### 2.3.1 Maseru West

Maseru West is situated to the North West of the Central Business District (CBD) referred to as Maseru Central on the map (Fig. 2.1). First, based on the Maseru City Council's classification (Table 2.1), Maseru West is considered as a high income residential in this study. Furthermore, the decision was based on the personal observation of several socio-economic indicators such as car ownership and type of house. Most of the people in this suburb have expensive cars, live in beautiful and big houses of which some are double stories, their children attend expensive schools which are multi-racial commonly known as English medium schools. The residents constitute government executives such as, government ministers, judges, doctors, Chief Justice, senior civil servants, expatriates, the Prime Minister, as well as the Royal Palace. A large proportion of the houses in Maseru West are government-owned, while the rest are owned by private corporations such as the Lesotho Housing Development Corporation (LHDC) and the Lesotho National Development Corporation (LNDC). A few houses are privately owned. The private flats are rented out at high costs and only people earning high salaries can afford them.

Maseru West is a low population density area, meaning that, there are few people per square kilometre and each household occupies a big yard. According to the 1996 population census, Maseru West has a total population of 2 813 and covers an area of approximately 1.16 km<sup>2</sup>, giving an average population density of 2 425 persons/square kilometre. It has about 1 676 households, giving an average household family size of less

than two. Although the average population size is two per household according to 1996 census, the results of this study estimate the average household size to be five.

### 2.3.2 Sea-Point

Sea-Point is located adjacent to Maseru East on the North West of the CBD/ Maseru Central (Fig. 2.1). Sea-Point, in contrast to Maseru West, is classified as a low income residential area (MCC, 1990) and because of the low standard of living of the people. Many people in Sea-Point live in absolute poverty. This suburb is characterised by many rented out lower standard houses consisting mainly of single or double rooms. The houses are over-crowded because of small stands, high unemployment rate and low income, resulting in approximately 5 to 10 persons sharing a room or two. Sanitation is poor in this suburb, causing prevalence of diseases such as tuberculosis, diarrhoea and other water-borne diseases.

Most of the houses in Sea-Point belong to individual landlords who rent them out to tenants, especially people who come from the rural areas to look for jobs. The rent for these houses is cheap and at least affordable to low income people who are mostly factory workers, domestic workers, and even those who are not working. Many children in this location attend government, community and church schools which are cheap, or they attend school. Sea-Point is a high density area, meaning that there are many people per square kilometre. According to 1996 population census, Sea-Point has a total population of approximately 3533 and covers an area of approximately 0.68 km<sup>2</sup>, giving an average population density of 5196 person/ square kilometre. It has about 984 households, giving an average household family size of four. According to the results obtained in this study, Sea-Point households have an average household size of seven persons.

**Table 2.1: Estimated Refuse Collection Service Coverage by Wards - Maseru City Council (1990)**

Ward no.	Location (Area)	Type of Residence	Percentage of Coverage
1.	Maseru West	Low density residential area mainly for high income group.	80
2.	Maseru Central	Commercial, institutional and partly residential area.	65
3.	Sea-Point	High density residential area mainly for low income group.	30
4.	Maqalika, Maseru East, Moshoeshoe II, Khubetsoana	Mixed, high, middle and low income groups	50
5.	Thetsane and Race Course	Mixed, high and low income groups	50
6.	Qoaling	Mainly middle and low income groups	30
7.	Thamae Lower and Upper	Middle and low income groups	30
8.	Tsiu	Mainly low income group	No service
9.	Motimposo	Mainly low income group	No service
10.	Mabote	Mixed high, middle and low income groups	No service
11.	Majoe-a-lit'soene	Mainly low income group	No service
12.	Borokhoaneng	Mainly low income group	No service
13.	Lithoteng	Mixed income group (high, middle and low)	No service
14.	Lithabaneng	Mixed income groups	No service
15.	Abia	Mixed income groups	No service
*16.	Tikoe	Mainly low income group	No service

Source; Maseru City Council Health and Environment Department (undated)

\* Rametse *pers.com.* 1997.

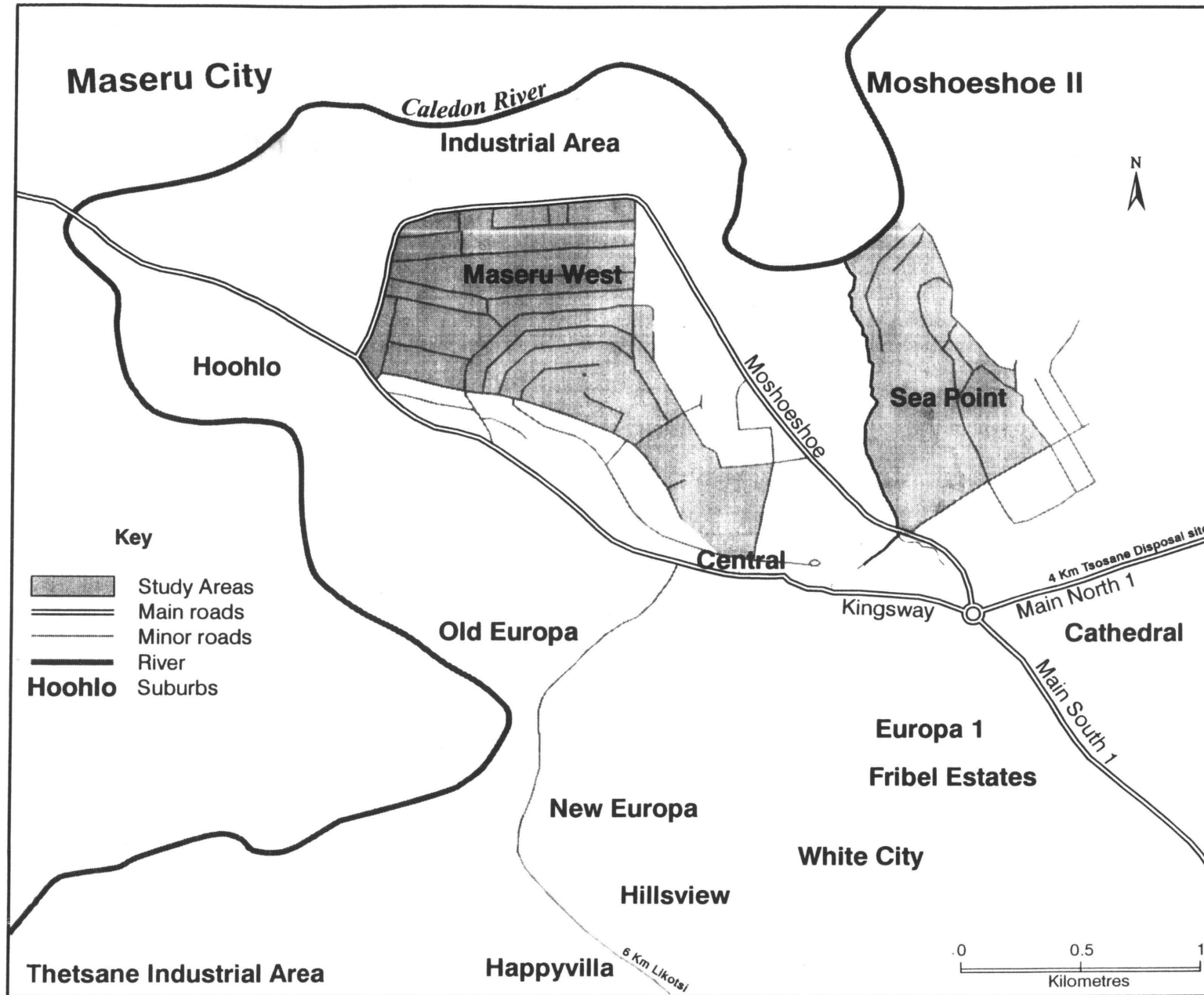


Figure 2.1 Location of the Study Areas

## **2.4 Data Source**

The data for this study were drawn from various sources. First, relevant literature was reviewed, including books, journals, Internet, articles, papers, and published and unpublished documents. Secondly, relevant government and local authorities departments were visited, where interviews were conducted with senior officials. Thirdly, a sample survey study was conducted and a questionnaire was administered to households. The mass of waste generated was measurements. Finally, the disposal site was visited for physical inspection.

### **2.4.1 Literature Review**

The literature on waste management in southern Africa is limited and most of the books available were published in developed countries and the information was considered not entirely relevant for this research. However, a review of the waste management situation in South Africa, Zimbabwe and Zambia was compiled including the use of published government materials, and Internet sources, as discussed in chapter 3 (literature review). On waste management in Lesotho, specifically, there were only two studies found relevant. These were conducted by the Lesotho Government and NES in 1987 and 1997, respectively. The two studies were not comparable as the first one looked at solid waste management in Maseru only while NES was a base line study on waste management in Lesotho and was of limited use, as it presented data for the country as a whole, rather than for individual districts.

### **2.4.2 Oral Interview**

Interviews were conducted with the Director and the Environment Health Officer of the Environmental Health Section of the MCC. At the National Environment Secretariat, interviews were held with the United Nations Volunteer responsible for Environmental Impact Assessment (EIA) and the Chief Technical Advisor of the National Environment Youth Corps.

### 2.4.3 Household Survey

Finally, a survey study was conducted in Maseru West and Sea-Point in order to determine the quality and character of waste being generated at various sources. The 1996 census was used to find the number of households in the study areas. It indicated that there are more households in Maseru West than in Sea-Point, therefore, a bigger sample was used in Maseru West for representativeness (60 households) as opposed to (50 households).

Each household was provided with a questionnaire (Appendix 1) as well as two refuse bags numbered A1, B1 to A60, B60. Bag A was for non-organic waste and bag B for organic waste. This was done so that the bags could later be matched with the questionnaires. In both areas, the questionnaires and bags were left with the household heads or another responsible member in the case of unavailability of the household head. The survey was an attempt to examine and analyse the sampled households with regard to the levels of income, education, the gender of the household head and household size and how these factors influence the amount and type of waste generated.

Both bags and questionnaires were collected after a week. Fifty out of 60 sampled households in Maseru West returned the bags and questionnaires signifying an 83% return, whilst in Sea-Point, 40 out of 50 households returned the bags and questionnaires, representing an 80% return. The bags were weighed and non-organic waste was classified further into recyclables and non-recyclables. No non-recyclables were found. But, it should be noted that things like batteries would fall under non-recyclables. The recyclables were then weighed separately, these included paper, plastic, cans, and glass(bottles). For the purpose of this study organic waste was not classified further. Some households did not return their bags because the bags were misplaced or were torn by dogs, whereas failure to complete the questionnaire was associated with forgetfulness, misplacement or destruction by children.

The survey was administered by the researcher and an enumerator, who was trained to help in the administration of the survey. The survey was conducted in August and

September 1997. To ensure the quality and control of the study, an unstructured sampling method was used to select households, meaning that every fourth house was selected. This was done to ensure that all households had an equal chance of being selected.

#### **2.4.4. Field Inspection**

A field inspection was made in order to assess and evaluate Maseru's waste disposal site, including the security at the disposal site and the types of waste deposited. The operation of the site was also investigated.



## CHAPTER 3

### 3. LITERATURE REVIEW

#### 3.1 Introduction

The UNEP report (1997) which presents information on the state of the global environment, describes the environmental implications of rapid globalisation, particularly through developments in information technology, transport and trade regimes. The report states that whenever management and disposal of industrial and domestic waste is inadequate, soil and water will be contaminated.

According to the literature, the environment of today endangers our health and our general well-being. According to Dalal-Clayton (1997), the rapid urbanisation in southern Africa has led to problems such as squatter settlements, where unsanitary conditions due to inadequate/ lack of services, urban waste and crime are very high. The implications of which are vulnerability of the household, low economic level of the household and poor environment. The author indicates that waste management is poor in this region because of poor infrastructure due to high costs and lack of planning. According to him the current population is estimated at 136 million and this is expected to double by the year 2015, mostly because of rural-urban migration.

Booth *et al* (1994), on the other hand, comment that waste has not received much attention in the southern African region, yet it is a growing problem as economic development (imports) increases the amount of packaging and plastics. The authors further indicate that litter degrades slowly or not at all and can be swallowed by animals, birds, etc. However, they found out that there are reports throughout southern Africa giving evidence of increased littering. The South African President Council's report in Booth *et al* (1994) alleges that the unsightly waste in the natural environment is an overriding impression when travelling through Namibia. According to this report in South Africa, there are more than 3 000 pieces of plastic in every square kilometre of the coastal water, which is almost twice as much as recorded in 1984. Poor waste management

strategies have to be blamed for this increase.

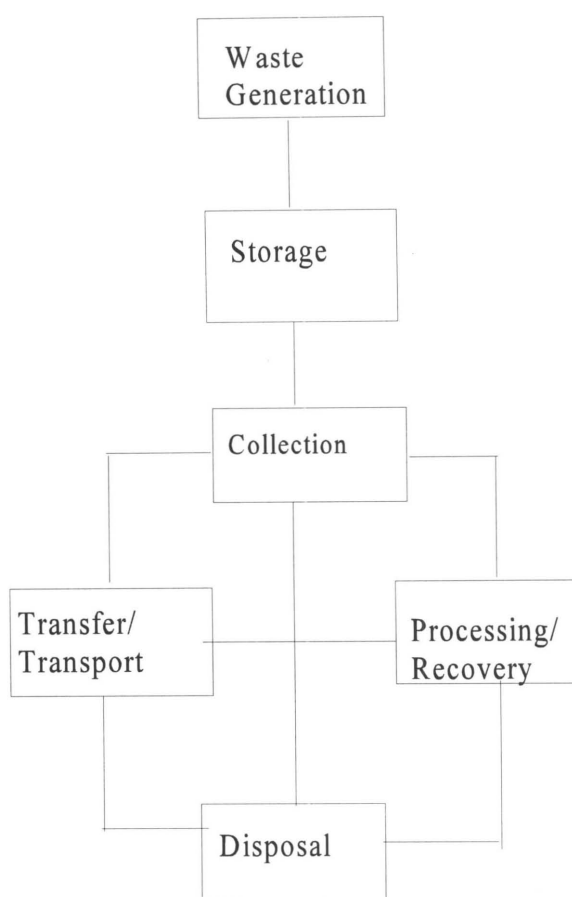
### 3.2 Waste Management

A waste management strategy is regarded by Mayet (1993, p5) as:

*“...the wise utilisation, proper management and integrated control of all waste material within a particular system, and of the three fundamental waste-receiving media (such as air, water and land) in an environmentally responsible and cost effective way, using the best environmentally acceptable and practically suited option”.*

The author argues that waste management process is a multi-disciplinary exercise and requires the input of a team with a wide field of expertise in order to deal comprehensively with the many facets of the problems. Tchobanoglous *et. al.* in Mayet (1993) divides waste management into six functional components which are also referred to as functional elements, as illustrated in Figure 3.1

Tchobanoglous *et. al.* in Mayet (1993) consider waste generation to be the first step in the waste management process. The authors believe that waste should then be stored or put together for collection. After collection waste is transported and or processed before disposal, the final stage in the waste management process.



**Figure 3.1. Functional Elements in Waste Management Process (Tchobanoglous *et. al.*, 1977: in Mayet, 1993).**

The model cannot be taken as universally true as the components of waste management vary from situation to situation. For example, Clayton and Huie (1997) divide waste management into three components which are namely, storage, collection and disposal. This study combines elements from Tchobanoglous *et. al.* in Mayet (1993) and Clayton and Huie (1997) to focus on generation, collection and disposal components as key concepts, since for disposal to take place the other components of storage, collection and transportation are implied.

### **3.2.1 Key Concepts: Generation, Collection and Disposal**

In the literature reviewed, most texts tended to cover the key concepts of generation, collection and disposal of waste on southern Africa in general. There appears to be a

general consensus as far as the factors influencing the amount of domestic waste generation and the availability of data. For example, Dalal-Clayton (1997) indicates that the data about waste generation in southern African region are limited, making it difficult to assess overall pollution in the region and its impact on the environment and human health. There has been no long term regional study of pollutants, and even when known to exist, pollution is not always monitored. Therefore, the author concludes that pollution controls do not exist in some countries or where they do, they are often poorly enforced.

Tevera (1991), on the other hand, is of the opinion that, in developing countries the amount of solid waste generated is relatively small, because of low incomes and consumption levels as well as the prevalence of scavenging and salvaging activities. The author observed that the waste generated varies both in quantity and composition with socio-economic status and consumption habits. In general, the *per capita* generation of waste for high income households in the low density areas is higher than that of low income households in the high density areas (Tevera, 1991). He argues his point using Table 3.1 which compares the refuse generation rates in selected cities.

**Table 3.1: Waste Generation Rates in Selected Industrial and Low Income Cities**

<u>City</u>	<u>Per Capita Waste Generation Kg per day</u>
<b>Industrial Cities</b>	
New York, U.S.A	1.80
Singapore	0.87
Hong Kong	0.85
Hamburg, W. Germany	0.85
Rome, Italy	0.69
<b>Low Income Cities</b>	
Lahore, Pakistan	0.60
Tunis, Tunisia	0.56
Bandung, Indonesia	0.55
Medellin, Columbia	0.54
Karachi, Pakistan	0.50
Manila, Philippines	0.50
Kano, Nigeria	0.46
*Maseru	0.43

Source: Tevera (1991)

\*Source: NES (1997a)

From Table 3.1, it is evident that industrialised cities generate more waste than low income cities. Maseru, even though not included on the list, according to NES, generates 0.43 kg per capita per day which is even lower than Kano in Nigeria, suggesting that Maseru is the poorest of the listed cities.

### 3.2.1.1 Waste Management in South Africa

The generation, collection and disposal of solid waste in South Africa is reviewed. Mayet (1993) observed that academic research on the subject is very limited. According to the author, population growth, urbanisation, industrialisation, mining and intensive agriculture are the main contributors to waste generation and pollution in the country. The total waste stream in South Africa was estimated to be 460 million tonnes per year in 1991, of which approximately 374 million tonnes per annum is generated by the mining industry, 22 million tonnes per annum is industrial waste, the average generation of domestic and retail waste is approximately 5 million tonnes per annum or 0.4 kg per capita per day, and other wastes, including sludge and waste from agriculture and forestry make up to 49 million tonnes per annum (Anon., 1991). He states that domestic waste in South Africa consists largely of paper products, plastics, glass, metal and organic waste. The study further, shows that waste generation rates in South Africa rise with economic growth and the rising standards of living. This implies that waste will quickly exceed the capacity of existing and planned waste facilities.

With regard to waste collection, Fuggle and Rabie (1996) observed that waste collection in South Africa has evolved with development of modern infrastructure which includes the vehicle collection systems, manpower, collection routes, public health by-laws and regulations and aesthetics. Industrial waste collection and storage have been highly mechanised because of bulk material handling problems created by industrial waste.

A survey of waste disposal practices in South Africa submitted to the President's Council in 1991 states that the position of solid waste management in the country is unsatisfactory and presents a serious threat to human health and environment. Furthermore, South African landfills have been badly sited, designed and operated, and this has led to adverse impacts on the environment, quality of life and even public health (Anon., 1991). Shand (undated) indicates that 95% of domestic waste generated in South Africa is disposed of in landfills which remain the major disposal method for the foreseeable future as it is economical and environmentally friendly. Gerrans (1994) states that of 1600 landfill sites in South Africa still in use, only 40 are properly licensed. The figure has risen according

to Burge (1997), by February 1997, some 255 waste disposal sites had been issued with legal permits. According to Gerrans (1994), many of the unlicensed sites contain hazardous waste because most waste is not sorted or treated before dumping. Therefore, potential health risks.

South Africa's population is expected to grow from 29.1 million in 1985 to 59.7 million by the year 2010 (Shand, undated). With this, it is suggested that it will be essential to pay closer attention to the development and management of waste disposal sites and to address problems facing the growing number of informal settlements as they contribute to environmental deterioration.

### **3.2.1.2 Waste Management in Zimbabwe**

The generation, collection and disposal of solid waste in Zimbabwe is reviewed. Tevera (1991) observed that in Zimbabwe, reliable figures on the amount of solid waste produced daily in Harare are not available because most of the waste is not weighed. The report indicates, however, that waste disposal statistics computed by the City of Harare show that, on average, each resident discards 0.53 kg of refuse per day. He further states that the collection of domestic waste is carried out by the City of Harare's Department of Works whereas industrial waste is collected and transported to the council-operated waste dumps by the individual generators of waste or by a specialist contractor. He states that in Harare the collection and disposal of waste is viewed as a "Cinderella service" which in the eye of the local authority, can operate on small portions of the municipal budget. Consequently, the city's waste management infrastructure is inadequate and overloaded. Shortage of refuse vehicles is the biggest factor hindering the efficient collection and transportation to disposal sites of refuse in most Zimbabwean cities. He says council authorities pointed out that Harare has 18 refuse vehicles when in fact 69 are needed at any one time.

Although it has already been indicated that much of the waste in Southern Africa is dumped in open spaces, rivers and dongas, the literature reviewed on Zimbabwe shows

that there are three methods of waste disposal in Harare, namely, sanitary landfill, composting and illegal dumping (Tevera, 1991). This is also generally true of most towns in developing countries, Lesotho being included.

The report shows that more than 85% of the solid waste generated in Harare is disposed of by sanitary landfilling. The council-operated composting plant is used to convert refuse from non-biodegradable material into compost. The operation is ideal because of the high vegetable content of the refuse collected from the residential areas. The operation is however, not economically viable as compost is bulky and expensive to transport. The illegal dumping is caused by long neglect of sanitary landfills in the high density areas. The high number of persons per room ratio coupled with the city's policy of issuing one plastic bin per house and the general infrequent removal of refuse make the attainment of modest sanitation standards difficult (Tevera, 1991). His observation is that quarries are mostly used as official dump sites in Harare. The possibility of incineration as an alternative to sanitary landfill was considered but, because of the high cost of machinery, the option was considered non-viable.

### **3.2.1.3 Waste Management in Zambia**

The literature on generation, collection and disposal of solid waste in Zambia was done. Waste in Zambia is generated mainly by mine operations, domestic, commercial, public activities, hospital/clinic services and industrial processes (Chipungu and Kunda, 1994). One million tonnes of municipal waste are generated per annum and most of the solid wastes is not collected due to a lack of resources. Thus, the city of Lusaka only collects 8% of the total amount of waste produced per day, the remaining 92% is left to contribute to pollution and defacing of the town (Chipungu and Kunda, 1994).

In Zambia, as well as in other Southern African countries, waste collected is disposed of in some 60 non-scientific municipal landfills scattered throughout the country. Ravines, dambos, pits and disused laterite quarries that have no environmental safeguards are also used for dumping. Land-filling is the most used waste disposal method in all towns of Zambia. No safeguards are, however, in place to protect surface and groundwater



pollution through wash away and leachate and there are no measures taken to guard against nuisance of smell, flies, fires, and scavenging (Chipungu and Kunda, 1994).

#### **3.2.1.4 Waste Management in Lesotho**

The National Environmental Action Plan was drafted to provide a framework for incorporating environmental considerations into the nation's economic development and to focus and facilitate the co-ordination of the nation's environmental endeavours. The plan identified areas of environmental concern which are of the highest priority and specifies the actions necessary to address those problems. The main problem was the use of hazardous agricultural chemicals. The plan indicates improper use of chemicals particularly hazardous pesticides and as one of the problems facing agricultural sector. Furthermore, lack of legislative powers in this area has resulted in harmful substances, banned in other countries finding their way into Lesotho (Kingdom of Lesotho, 1989).

Another problem highlighted by the plan is pollution. Urban development and industrialisation without proper planning are believed to have introduced environmental problems such as careless disposal of waste, air pollution from burning of coal and water pollution from the disposal of waste into rivers used as sources of drinking water. Inadequate pit toilet systems have also become a health hazard in the spread of diseases.

Little information is available with regard to waste generation and management in Lesotho. As a result, much of the waste generated is not collected and there is no official recording of the waste generated. The Lesotho Government (1987) estimates that the lower limit of the refuse generation for Maseru City is 1 000 tonnes per annum while a recent study by NES (1997a) estimates that 802 389 tonnes of waste is generated. Of this, commercial and small scale enterprises contribute 90,7%, industries 2,0 %, institutions 3,9% and households 3,9%. Of the total waste generated, only 0,6% is recovered per annum. The remaining 99,4% is left to contribute to the pollution and degradation of the towns. This percentage is slightly higher than that of Zambia which is 92%. According to the study, an average household generates 110,8 kilograms of waste per year and 0,43 kg of waste is generated per capita per day. The two figures do not agree because the

latter gives 156,95 kg per capita per year, this seems to be higher than what the household generates. It is thus difficult to check figures with the NES as the consultant who conducted the study is not based in Lesotho.

The NES (1997a) survey revealed that the type and quantity of waste generated by any society is a function of several factors, including level of socio-economic development of a country, population characteristics and associated cultural and consumption patterns, the existing biodiversity, settlement patterns, level of social services and infrastructure and technological advancement.

According to NES (1997a), the issue of solid waste disposal in Lesotho started to be addressed seriously in the mid-1980s after the emergence of strong global concern about the environment and pollution, whereas, more emphasis was placed on sewage in the late 1970s. For instance, water treatment facilities, such as sewage ponds are available in all district. of Lesotho. Although the report states that waste disposal in Lesotho has now been addressed, it is not adequate as there are still no proper landfills, no recycling plant and no composting plant in the entire country. Awareness with regard to waste sorting and waste treatment is not there among Basotho. As a result, waste is still disposed of unsafely in open spaces and dump sites which are not properly managed.

The Lesotho Government (1987) has reported that only about 4 300 plot owners, excluding public servants, have availed themselves to the existing waste service. Therefore, the bulk of the services is rendered to commercial, industrial and institutional refuse generators and high income residential areas. According to the report, a large area of the city does not receive a refuse removal service. The results of the survey show that there are at least 15 areas surveyed by Maseru City Council which form part of the city and these are called wards. Each town office renders a garden refuse collection service on demand at a charge of about M12.00 per load. At the moment, there is no special landfill for hazardous waste. As a result, the radioactive waste generated by the Queen Elizabeth II hospital and oil filters from transformers are exported for final disposal, but the report does not indicate the country to which they are exported (presumably RSA).

The NES (1997a) has shown that the volume of waste generated in Lesotho has increased significantly in recent years as a result of increased economic activities and high population growth rate, but this has not been accompanied by an equally significant expansion in the waste collection services. Furthermore, the report indicates that there is uneven waste collection coverage. In some urban areas, for instance, householders enjoy 80 % collection service coverage by Maseru City Council (MCC), while others have only 13% coverage.

According to the report, there was no formal refuse collection service recorded in the peri-urban and rural areas and as a result, 75% of peri-urban households, 56% of households of other urban areas and 59% of rural household resort to waste burning. The report also indicates that dumping of waste either in backyard pits or in open spaces is also common, particularly in the rural areas where 42% of the households are found to use this method. MCC and the offices of the Town Clerks (Town Clerks operate at districts level) are responsible for the collection and disposal with a coverage of 56%. It is shown that the MCC/Town Clerk's offices, services of private agents and self collection balance amongst industrial establishments. Self collection and disposal were found to be common in the commercial and institutional sectors (18% and 20%, respectively ). Burning was found to be popular in all sectors but more so in the industrial sector, where 17% was recorded.

In cases where formal waste collection service exist, coverage was uneven, minimal and irregular. The MCC services have concentrated in two electoral wards, i.e. Maseru West and Maseru Central. According to the report, waste collection from business premises is free, while that rendered to domestic premises carries a charge of M4.00 per month. It is noted that, it is common in the district centres for two districts to share a tractor service. Irregular availability of tractors allows waste to accumulate and induces waste generators to dispose of their waste at the nearest unoccupied or undeveloped site.

In Lesotho, like in Zimbabwe and Zambia, waste is dumped in open spaces, roadsides and rivers, characteristic of most developing countries especially Southern African countries (Dalal-Clayton 1997). In these countries, waste is the responsibility of the local

authorities whose quality of work is declining (Chipungu and Kunda, 1994).

Both studies involving Lesotho indicate that the refuse collected by the Maseru City Council is disposed of at the disposal site at *Ha Tsosane* (Fig. 3.1). This site is used by the city council but is not a legal site for waste disposal. Action has been made, however, to close it down and move to an alternative site, but this is going to take time due to inadequate funds. The Lesotho Government (1987) states that the disposal reflects the deposition rate of 32 tonnes per week while the other study does not mention disposal rate.

The NES (1997a), however, comments about the absence of the law governing the siting of refuse dump sites in Lesotho. The report further states that many dump sites are not fenced or in the cases where they are, they are not attended in order to keep people and animals out. It says there is no control over which type of waste should not be dumped and effective on-site supervision is lacking.

The National Environmental Action Plan of June 1989 calls on the government “to initiate a comprehensive review of the legal needs of the nation for environmental management and protection, and on the basis of that, develop a comprehensive framework of environmental legislation” (Witzsch, 1992, p.1). There is no environmental framework law in Lesotho at present, but this has been prepared and awaiting promulgation. According to the draft State of Environment Report for Lesotho (1997), the current laws deal only with responsible government authorities for the removal of waste and charges thereof (NES-LEA, 1997c). It suggests that there should be an Act covering a variety of (potentially harmful) substances which looks into avoidance, recycling/recovery, treatment and safe disposal.

Since there was no anti-litter law in Lesotho, waste was dealt with in various separate pieces of legislation, regulations or by-laws, such as the Local Government - Model Sanitary and Public Health By-Law, 1963 section 17, under the “Sanitary Service Regulations”. This law according to Witzsch, (1992, p. 82) states that:

*“...In any area where a sanitary service has been established in pursuance of paragraph (1) of section sixteen, the following regulation shall apply:*

- (h) ...no person by himself or by any member of his family or by his servant shall throw or deposit, or allow to be passed into or upon any street or open space any refuse or waste matter of any description;*
- (i) ...no person by himself or by any member of his family or by his servant shall throw or deposit upon any land or premises any refuse or waste matter likely to cause nuisance, offence or annoyance;”*

A violation of these provisions, on conviction, carries a fine not exceeding M50.00, or in default of payment thereof to imprisonment not exceeding three months (section 33(1)). This law has been put in place but there is no enforcement. It was apparently felt that anti-litter regulations could be enforced only in those areas of Lesotho where corresponding public removal service exists. The M50.00 fine is also not functional and this is considered an inadequate deterrent by this study as many people can afford the fine.

Another regulation relevant to this study is Regulation 12, which reads:

- “(1) Whenever a service for the removal of refuse has been established for a particular area, every occupier of premises within that area shall provide on his premises a sufficient number of receptacles for the reception therein of refuse as the health officer may direct, and he shall thereafter maintain and replace them as the health officer may deem necessary.*
- (2) Every receptacle provided in pursuance of subparagraph (1) hereof shall be*
  - (a) of a capacity not exceeding three cubic feet;*
  - (b) of galvanised metal or of other material approved by the health officer;*
  - (c) cylindrical in shape, and*
  - (d) fitted with an effective cover.*

- (3) *Every occupier shall cause all refuse from his premises to be placed within the receptacle provided in accordance with these regulations and not elsewhere.*
- (4) *Every occupier shall cause all refuse receptacles upon his premises to be covered continuously safe when refuse is being deposited therein and removed therefrom.*
- (5) *No occupier shall deposit, or allow to be deposited in any refuse upon the land or premises which he occupies.*
- (6) *No occupier shall deposit or cause to be deposited in any receptacle provided for the reception of refuse any unextinguished ashes or other material likely to cause a fire, or any liquid matter whatsoever.”*

It has been noticed, however, that Lesotho has several sectoral laws which are fragmented, overlapping and unco-ordinated. Individual Ministers are responsible for enforcing environment laws within their ministries. It is hoped that the new environment framework law will address these problems of overlapping and deficient environmental legislation.

The draft Framework Law provides for environmental standards. Without environmental standards and guidelines, it is impossible to measure air, water and waste pollution. At present, there is no waste management policy in Lesotho, but this is under going a serious discussion. Waste is, however, covered under Section 38 of the 1997 draft Framework Law which states that:

*“...The authority shall, in consultation with the relevant Line Ministry-*

- (a) prescribe standards for waste, waste classification and analysis and formulation and advise on standards of disposal methods and means for such waste;*
- (b) issue guidelines, storage, transportation, segregation and destruction of hazardous waste;*
- (c) identify materials and processes that are dangerous to human health and the environment; and*
- (d) issue guidelines and prescribe measures necessary for the management of materials and processes identified under paragraph (c)”.*

Moreover, Section 77 (1) of the draft Framework Law states that:

*“...No person shall-*

- (a) own or operate a waste disposal site or plant;*
- (b) generate hazardous waste;*
- (c) store hazardous waste;*
- (d) transport hazardous waste;*
- (e) disposes of hazardous waste;*

*unless he is in possession of a licence to own or operate a disposal site, generate, store, transport or dispose hazardous waste” (NES-LEA, 1997a, p.47).*

The Framework Law also introduces the concepts of Environmental Impact Assessment (EIA.), audits and monitoring of projects. The EIA is hoped to minimise environmental degradation which may be caused by the project since it gives information about environmental degradation before and after a project is implemented. The EIA Guidelines for Lesotho are issued by the Lesotho Environment Authority (LEA) under Lesotho’s 1997 Environment Act (NES-LEA,1997d). According to these guidelines, EIA is designed to identify, quantify where possible, assess, evaluate, and make public the potential consequences of a development project and its alternative, involving all relevant stakeholders in the process.

The Environmental Policy for Lesotho (1996) was prepared by the National Environment Secretariat with the objective of assisting in the establishment of an Environmental Framework Law for Lesotho. It therefore gives the following principles:

1. Utilising the most reliable and appropriate waste treatment systems for domestic, commercial and industrial wastes will minimise environmental hazards.
2. Setting up and enforcing standards for the disposal of human and other solid wastes in homes, offices, housing estates and public facilities in both urban and rural areas will lead to reduced incidence of environmental disease and mitigate against surface and ground water contamination.

According to the Policy, the following strategies are put in place and will be implemented by COWMAN:

1. Design environmentally friendly waste disposal and treatment systems that will take into consideration the geographical and environmental setting and encourage recycling.
2. Ensure that the location of disposal sites do not pollute surface and under ground water systems.
3. Establish monitoring programmes of approved waste disposal sites, waste water treatment systems, industrial waste pretreatment plants and their surroundings to mitigate environmental pollution.
4. Establish environmental standards for the location of water wells, boreholes and dams in relation to major sanitary landfill sites.
5. Prescribe and strengthen regulations for the safe waste disposal.
6. Provide information on the appropriate methods and technologies for the treatment and disposal of waste.
7. Put in place effective protective measures against discharge of particular matter and untreated industrial effluents into rivers, wetlands, dams and other water bodies.
8. Encourage community and public recycling of bottles, cans and other recyclables through use of deposits, local recycling of collection points, and other financial incentives.

With regard to gender issues, the literature reviewed on gender in Lesotho indicated that about 54% of households in Lesotho were headed by females (World Bank ; cited in Dyer and Motebang, 1995). The authors state that some women choose to be heads of the households by being single parents while for others it is a situation thrust upon them by death or desertion of their partners or as a result of migration especially to the mines. Sechaba, as cited by Dyer and Motebang (1995), observed that female headed households are amongst the poorest in Lesotho.

The fact that women and men in Lesotho have not been equal beneficiaries in the process of development is one of the causes of poverty amongst female headed households. Women hold insignificant numbers of decision-making positions at all levels of



government, and in public and private sectors, although there has been a recorded rise in the number of women involved in policy-making from the 1980s to the 1990s (Dyer and Motebang, 1995). This is shown by the Table 3.2:

**Table 3.2: Participation in Parliamentary Assembly**

	1985		1994	
	Women	Men	Women	Men
Members of the National Assembly	1	80	3	62
Members of Senate	0	0	7	25
Cabinet Minister	0	12	1	12
<b>Total</b>	<b>1</b>	<b>92</b>	<b>11</b>	<b>109</b>

Source: GOL Bureau of Statistics, cited in Dyer and Motebang (1995)

**Table 3.3: Participation in the Policy-Making Level of Government**

	1985-1992		1993-1994	
	Women	Men	Women	Men
Minister	0	12	1	11
Deputy Minister	1	3	0	2
Principal Secretary	2	18	2	14
Deputy Principal Secretary	2	14	7	14
<b>Total</b>	<b>5</b>	<b>47</b>	<b>10</b>	<b>41</b>

Source: Various government Departments, cited in Dyer and Motebang (1995)

Tables 3.2 and 3.3 show a gradual rise in senior ranks of women. Dyer and Motebang (1995) show that women are significantly over-represented in the lower ranks of civil service. Men are in 83% of the senior positions whilst women occupy only 17% of these positions.. There is a clear indication according to that study that male-headed households are receiving higher incomes than their female counterparts.

Apart from employment discrimination, women were also discriminated against in education. The study by Dyer and Motebang (1995), shows higher participation of women in primary, secondary, technical and teachers training schools than men. In terms of undertaking further studies, however, especially out of the country, men were in the majority, since they were automatically paid a dependants allowance of 60% of monthly salary, whereas women had to prove that they were the sole breadwinners in their families (Dyer and Motebang,1995).

# MAP OF MASERU

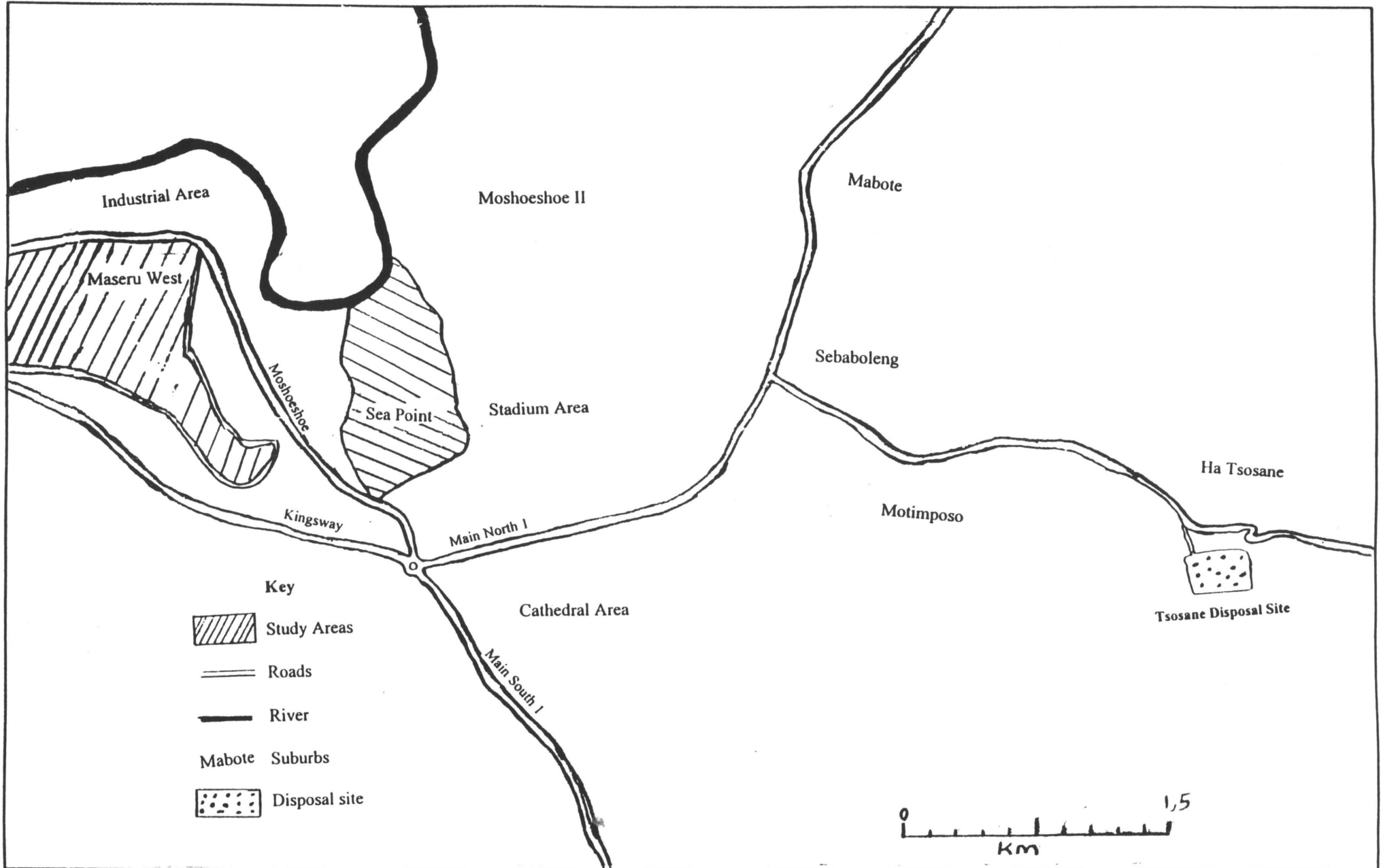


Figure 3.2 Location of the Disposal Site

### 3.3 Problems of Waste Management in Southern Africa

Booth *et al* (1994) identified three main problems associated with waste management in southern African countries, Lesotho included:

- a) The standard of rubbish disposal throughout the southern African region is poor due to the high disposal costs. Disposal sites/landfills are situated near residential areas and infrequently covered with soil, attracting vermin and leading to the spread of disease. Poisonous substances such as pesticides are often disposed of in municipal dumps without any special treatment, instead of being disposed of separately.
- b) When burned, municipal and industrial wastes at disposal sites/landfills release a complex mix of contaminants into the air together with smoke and particles. The health effects have not been studied in southern Africa, but in other parts of the world burning dumps have been found to produce dioxin, one of the deadliest chemicals.
- c) Protecting water supplies is not usually a consideration in selecting disposal sites/landfills. Typical disposal/landfills produce thousands of litres of leachate. The leachate run into underground and surface water supplies, resulting in water pollution.
- d) Hazardous wastes are not always disposed in 'official' waste sites throughout the region. Industries seeking to keep their costs down dump wastes in vacant lots besides roadways, and local councils often lack transport and equipment to collect and treat abandoned wastes.

In general, people tend to dump their waste illegally in this region not only because of inadequate disposal services but also due to lack of civic education specifically on waste management. The general implication is poor environment and increased health hazard.

### **3.4 Environmental Problems of Waste in Southern Africa**

According to Chipungu and Kunda (1994), the following are general problems encountered by the communities living closer to the unsanitary landfills or dump sites in Zambia, but these would appear to be general problems in southern Africa:

- i. Odour nuisances from anaerobic processes.
- ii. Hygienic and aesthetic problems from light waste materials that are blown away and the health problems associated with pests such as rats, flies, etc..
- iii. Uncontrolled access of people, who swarm sites to scavenge reusable or edible waste.
- iv. Dangers of leachate which can pollute under-ground water resources.
- v. Danger of landfill explosions because of methane.

According to the findings of the authors, the scientific literature does not contain the data required to support quantitative estimates of direct relationships between solid waste and diseases. The obvious effects of solid waste management are aesthetics problem and the air and water pollution caused by unsatisfactory means of disposal. Solid waste can hinder the use of land they occupy and diminish the value of nearby land. Flies are amongst the list of well known carriers of disease, and unfortunately, they breed in large numbers in many types of solid waste.

### **3.5 Waste Minimisation Strategies**

Gerrans (1994) postulates that humans play a meaningful and positive role in helping to find solutions to the problems of waste by first changing their life-styles, according to the following guidelines, reducing waste generation, re-use of materials and recycling of materials.

### 3.5.1 Reducing Waste

According to Gerrans (1994), the following are useful points to bear in mind in waste reduction.

- Before buying a product, read the label to make sure it is what you want.
- Don't buy more than you need.
- Look around for alternative products which are more economically packaged and/or less hazardous but equally effective
- Read the instruction on the label on how to use a product and dispose of the container

### 3.5.2 Re-use of Materials

Re-use is considered the simplest and cheapest method of waste minimisation by Gerrans (1994). It means simply using the product more than once, for example, the 20 litre plastic bottles/ containers are used to fetch and store drinking water especially in the rural areas, the plastic bags from the supermarkets are used to carry other things such as shoes to the shoe maker, small luggage when one is travelling, to carry books especially in the rural areas where parents cannot afford to buy school bags for their kids, and glass bottles/ containers are used to store household utilities such as sugar, milk, etc.

### 3.5. Recycling of Materials

Recycling is considered an excellent way of handling waste by Gerrans (1994). For the householder, he argues that the waste includes paper, metal, glass and plastic. He believes that if all these materials are recycled what remains for disposal is largely organic material which is ideal for composting. He defines composting as a biological decomposition of organic waste under controlled conditions. Further, he considers recycling as fundamental as it is complementary to other processes which invariably produce residuals for disposal, for example, incineration.

Although waste reduction is important to do, the points given for waste reduction are less likely to apply to Maseru or indeed many Third World countries because of the low level of economy and poor living standards.

The advantages of implementing a recycling programme include;

- a decrease in waste tonnages
- the creation of new markets and jobs
- raising the level of environmental awareness
- extending the life span of existing landfill

Durban Solid Waste (undated) has identified the following recycling companies in South Africa.

**Cans:**

ACRA

The Can Man

Collect-a-Can

**Glass:**

Willgro Recycling

**Paper:**

Mondi Recycling

Nampak Paper Recycling

Sappi Waste Paper

Burge (1997) states that almost every tonne of paper produced in South Africa has a recycled content. He states that South Africa recycles 28.4% of the tonnage of paper, 14.8% of tonnage of plastic and more than 29% of beverage cans. These figures are likely to have gone-up. NES (1997a) indicates that Lesotho so far is supplying South Africa with recyclable products as it has not yet establish its own recycling plants. It says market for recyclables is dominated by a few refuse collection agents who have established commercial links with giant South African companies. The major external markets according to them are in Gauteng and Kwazulu - Natal Provinces. The report says the recycling agents in Lesotho include:

- Welcome Waste Sorting Plant and Recycling (WWSPR)
- Collect-A-Can
- Maseru Waste
- Aggregate Export Supply

Even though recovery of recyclable waste exists in Lesotho, the report indicates that thus far, there are no records on the extent of waste recovery in the country.

### **3.6 Conclusion**

In general, developing countries, especially, southern African countries, have common problems concerning waste management: inadequate waste collection by councils or authorities, leading to high rate of illegal dumping in open spaces; lack of data on waste management because waste is not weighed; lack of appropriate laws governing waste management and the overall implication is poor waste management.



## CHAPTER 4

### 4. RESULTS AND DISCUSSION OF THE STUDY

#### 4.1 Results

This chapter discusses the findings of the study and analyses the results obtained from the surveyed two study areas. It then outlines the results obtained from interviews with officials in the relevant government departments and finally, it gives the results of the inspection made at Maseru's waste disposal site.

##### 4.1.1 Gender of the Household Head

The gender of the household head was used in the study as one of the indicators that affects the level of income of the household and in turn the generation of waste. The results of the gender of the household heads are summarised in Table 4.1.

**Table 4.1: Gender of Household Head**

Household Head	% Households in Maseru West (n=50)	% Households in Sea-Point (n=40)
Female	25	70
Males	75	30
<b>Total</b>	<b>100 %</b>	<b>100 %</b>

n= sample size

According to the table, there were more male headed households in Maseru West than female headed households, while in Sea-Point there were more female headed households than male headed households. The results simply mean that there are more households headed by females in the low income residential area than those headed by males and that there are less households headed by females in the high income residential area than those headed by males. Since Dyer and Motebang (1995) have shown that households

headed by females are among the poorest in Lesotho 70% of the households in Sea-Point are likely to be poor, whereas, only 25% in Maseru West are likely to be poor. In general, people in Maseru West are wealthier than those in Sea-Point.

The study tends to agree with Dyer and Motebang (1995) in that the main cause of disparity between level of income and gender in Lesotho is the discriminatory laws against women. However, amendments are being made to give women full rights. It has been noted that the gender of the household head influences the total income of the household and this in turn has an impact on the quality and nature of waste generated.

According to these results, the hypothesis which was put forward in relation to gender is true.

#### **4.1.2 Education Level**

This study also investigated the level of education of the household heads because it believes that the level of education affects the level of income which in turn affects waste generation. Table 4.2 represents the results obtained for the education level of household heads.

**Table 4.2: Level of Education of the HH Head vs Waste Generation/HH/week**

Education Level	Maseru West (n=50)		Sea-Point (n=40)	
	% of Household	Waste (kg/week)	% of Household	Waste kg/week
Primary School	5	9.3	45	75.4
Secondary (Form A-Form C)	10	25.5	25	55.8
High (Form D-Form E)	20	58.0	20	61.6
Tertiary	65	213.3	10	30.3
<b>Total</b>	<b>100</b>	<b>305</b>	<b>100</b>	<b>223.1</b>

n = sample size

HH = household

The results in Table 4.2 reflect higher percentages of elite and greater amounts of waste generation in Maseru West than in Sea-Point. For example, about 65% of household heads interviewed in Maseru West were found to have attained tertiary education such as a university degree, college certificate/diploma or technical college certificate/diploma whereas only 10% in Sea-Point have attained the tertiary level. In contrast, most of the household heads interviewed in Sea-Point had a primary school certificate only.

The results simply mean a higher standard of education achievement in Maseru West than in Sea-Point. According to Dyer and Motebang (1995), there is a strong positive relationship between education level and income level. In most cases wealthier households have a higher standard of education and earn higher wages.

Reading habits may also influence the generation of waste. Educated people, for example tend to read more than less educated people and the educated elite people buy more newspapers and magazines which are produced daily or weekly. Most of these papers end up in the trash bin resulting in more waste paper being generated. This is why Maseru West was found to have a higher percentage of paper in the waste than did Sea-Point (see Fig. 4.1 p. 58.)

This study believes that more affluent people tend to have a better appreciation of waste management issues compared with their less educated counterparts. People in Maseru West seemed to be more environmentally conscious than those in Sea-Point. They get information through televisions, radios, news papers, etc. As a result, they become more informed about health hazards related to polluted environments, the importance of aesthetics on tourism and on the value of their properties. The results in Table 4.2 prove the hypothesis concerning education-income relationship and waste generation positive, that educated people generate more waste than less educated people.

#### **4.1.3 Income Level of the Household**

The survey also investigated the level of income of households. During the interviews, each householder was requested to indicate the total income of the household and the number of persons working. Income level, as discussed in previous sections affect waste generation, therefore, it is important to know the level of income of the household and the waste the household generates. The results about income level are summarised in Table 4.3.

**Table 4.3: Total Income per HH per Month vs Waste Generation/HH/Week**

<b>Total Household Income (in Maloti)</b>	<b>Maseru West (n=50)</b>		<b>Sea-Point (n=40)</b>	
	<b>% of Household</b>	<b>Waste Gen. in kg</b>	<b>% of Households</b>	<b>Waste Gen. in kg/ week</b>
<b>Less than 500</b>	0	0	40	68.2
<b>500 - 1 000</b>	5	10.5	25	55.8
<b>1 000 - 1 500</b>	10	23.5	20	54.6
<b>1 500 - 2 000</b>	35	110.6	5	14.2
<b>More than 2 000</b>	45	145.1	0	0
<b>Not specified</b>	5	15.3	10	30.3
<b>Total</b>	<b>100</b>	<b>305</b>	<b>100</b>	<b>223.1</b>

n = sample size

HH = household

Table 4.3 shows the total income level per household and the waste generation corresponding to those households. The issue of income is regarded as sensitive by many people, therefore the study decided to use an income range as opposed to an exact amount. Despite this, however, some households decided not to answer the question hence n=50 in Maseru West and n=40 in Sea-Point. Income levels in this study ranged from less than M 500.00 to more than M 2000.00 per household. The draft of the State of Environment in Lesotho indicates the minimum income on which a family can survive, based on the cost of staple foods, is at least M 25.00 per month per household member (NES-LEA, 1997c). Based on this, households in Maseru West are generally above the minimum, since the lowest income was found to be M 500.00 and the average family size was found to be five.

Table 4.3 shows that at least 85% of the households in Maseru West earn more than M 1 500 while in Sea-Point only 5% earn more than that. Although the two study areas were chosen as representative of high and low income residential areas, there were some exceptional cases in both areas (Table-4.3). Approximately 5% of the households in the

sampled area in Maseru West can be classified as low income and their waste generation patterns compared with those of in Sea-Point. Similarly, the 5% of households in Sea-Point which can be classified as having high income, had waste generation patterns similar to those in Maseru West.

In order to get the levels of waste generation per week, all the questionnaires which showed the same range of income per household were linked with their collected refuse as stated in the methodology, hence the masses were summed up. From the results in Table 4.3, there is a clear pattern of waste reduction as the income level drops. Thus, waste generation rises with increasing economic growth and with household income provided other factors remain constant. This further confirms the observation made by Tevera (1991) that industrialised cities generate more waste than low income cities. For instance, rich people have a tendency of buying more than they really need and end up having to dispose of some of their goods. In contrast, poor people buy what they can afford to meet their basic needs and consume everything they have, resulting in minimal waste. According to the results, the hypothesis which was put forward on the relationship between income level and waste generation is true.

**Table 4.4: Household Dependency Ratio**

<b>Dependency Ratio</b>	<b>% of Persons in Maseru West (n=50)</b>	<b>% of Persons in Sea-Point (n=40)</b>
<b>1:1</b>	8	0
<b>2:1</b>	40	5
<b>3:1</b>	32	10
<b>4:1</b>	16	30
<b>5:1</b>	4	10
<b>6:1</b>	0	15
<b>7:1</b>	0	15
<b>8:1</b>	0	5
<b>4:0</b>	0	5
<b>8:0</b>	0	5
<b>Total</b>	<b>100</b>	<b>100</b>

n=sample size

One parameter used for measuring the level of income of the household in this study is dependency ratio, i.e. the number of people depending on one person. This implies that if there are more persons depending on one person the income level of that household becomes low. Table 4.4 highlights the results obtained from the interviews. From the information gathered, dependency ratio were computed using the total number of people per household and the number of people working, e.g.

$$\text{dependency ratio} = \frac{\text{number of people in a household}}{\text{number of people working}}$$

Therefore, the dependency ratio in Sea-Point was found to be greater than in Maseru West (4:1 vs 2:1). This indicates a concentration of people with a low income level.

**Table 4.5: Household Cash Available *per Capita***

<b>Study Areas</b>	<b>Mean <i>per Capita</i> income per Month in Maluti (M)</b>
<b>Maseru West</b>	M 451.00
<b>Sea-Point</b>	M 203.00

Table 4.5 shows cash available *per capita* per month. The *per capita* per month of income level in Maseru West (M 451.00) was found to be higher than that of Sea-Point (M 203.00). Cash available *per capita* is another indicator of the quality of life, i.e. if cash available *per capita* is high it is likely that the standard of living will also be good. It is evident that Maseru West has low dependency and high cash available *per capita* as opposed to Sea-Point which has a high dependency ratio and low cash available *per capita*. Combining table 4.4 and 4.5, the message one takes home is that in Sea-Point at least six people depend on one person's income, which covers to M 203.00 per person, while in Maseru West only four people depend on one person and live on M451.00 *per capita*. The results confirm therefore, that the selection of Maseru West as representative of a higher income community was correct.

$$\text{Mean per person per month} = \frac{\text{number of people per household}}{\text{total income per household/month}}$$

#### 4.1.4 Household Size

The study also investigated the size of households as this is also believed to affect the rate at which waste is generated. The results thereof are summarised in Table, 4.6.



**Table 4.6: Household Size and Waste Generation**

Persons per household	Maseru West (n=50)		Sea-Point (n=40)	
	% of H/hold	Waste Gen. in kg/ week	% of H/hold	Waste Gen. in kg/ week
<b>One</b>	5	14.7	10	22.3
<b>Two</b>	20	62.0	10	22.0
<b>Three</b>	20	62.7	10	20.2
<b>Four</b>	40	120.0	15	35.6
<b>More than four</b>	15	45.8	55	122.8
<b>Total</b>	<b>100</b>	<b>305.2</b>	<b>100</b>	<b>222.9</b>

n= sample size

Based on the results obtained, there would appear to be a correlation between the level of consumption of the household and the number of persons per household. The average household size was seven in Sea-Point and five in Maseru West. These were calculated using the total number of people in the surveyed households each area divided by the number of households surveyed. The total number of people in the surveyed household was also computed from the questionnaires.

$$\text{Mean household size} = \frac{\text{total number of people in surveyed households}}{\text{number of households surveyed in each area}}$$

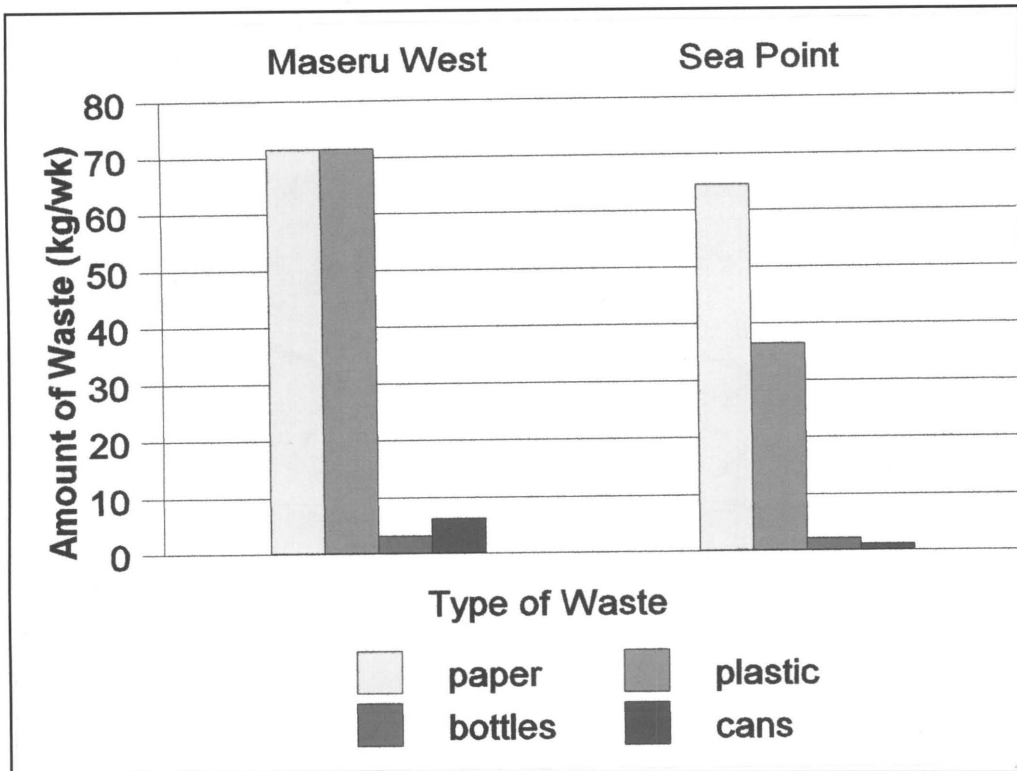
Taking other factors to be constant, the more persons there are per household the more they consume and thus the more waste they generate. Birth rate is still high amongst the less economically active labour force in Lesotho as it is difficult for such people to accept birth control measures. This might be one of the reasons why families in Sea-Point are still big.

In order to consider the mass of waste generated per week by household of different numbers of people, all the questionnaires having the same number of persons per

household were put together and the masses of their waste added up. According to Table 4.6, some 85% of households in Maseru West had <sup>Up to</sup> four people living together whereas in Sea-Point most households had more than four people living together. In particular it is noted that 40% of households in Maseru West consist of four persons, while 15% only of households in Sea-Point consist of four persons. Only 15% of the households in Maseru West have more than four persons per household and these generate a total waste of only 45.8% per week. According to the results, the size of the household lowers the economy of the household because many people result in a high dependency ratio and less cash *per capita, in general*. The Table indicates an increase in waste generation as the number of people increases in each residential area. Therefore the findings agree with the hypothesis that large households generate more waste generation than small households.

#### 4.1.5 Waste Generation

The composition of waste in the two study areas was generally the same although, the mass of the various components are different (Fig. 4.1). More paper was produced than plastic in Sea-Point while equal amounts of plastic and paper were produced in Maseru West. An explanation for having less plastic in Sea-Point is that plastic bags are obtained from shops during shopping and because of high poverty in this area, people buy less do shopping. Moreover, the few bags they have are re-used for carrying and storing goods at home. Most of the parents in Sea-Point cannot afford to buy school bags for their children and as a result their children use plastic bags for carrying their books, whereas in Maseru West, shopping is a hobby to many families.



**Figure 4.1: Types and Amounts of Recyclable Waste Generated in Kilograms per Week**

Figure 4.1 shows different types of recyclable wastes and the amount of waste generated in kilograms per week in Maseru West and Sea-Point. It also shows that there were few cans generated, especially in Sea-Point because cans are sold to Collect-A-Can for recycling, while bottles are re-used for storing food.

**Table 4.7: Summary of Weekly and Annual Waste Generation in Kilograms****Maseru West**

waste generation	Total mass in kg per week (n=50)	mass in kg per annum	Mass in kg per household per day	mass in kg per household per year
Recyclables	152	7 286	0.4	145.7
Organic	154	7 373	0.4	147.5
Total	305	14 659	0.9	293.2

n=sample size

**Sea-Point**

waste generation	Total mass in kg per week (n=40)	mass in kg per year	mass in kg per household per day	mass in kg per household per year
Recyclables	104	4 973	0.4	124
Organic	120	5 741	0.4	144
Total	223	10 714	0.8	268

n=sample size

Table 4.7 is a summary of waste generation in Maseru West and Sea-Point, showing a slightly greater mass of organic waste generation than recyclables. The total waste generated was 305 kg per week or 14 659 per year for Maseru West in 50 surveyed households and 223 kg per week or 10713.60 kg per year for Sea-Point from 40 surveyed households.

**4.1.6 Waste Collection and Disposal**

Collection and disposal of solid waste in Maseru have been carried out by Maseru City Council while sewage removal has been carried out by the Department of Water and Sewage Authority. In the present investigation, solid waste is collected from households in the surveyed areas and taken to the disposal site by MCC's tip-pak trucks once a week.

**Table 4.8 Frequency of Waste Collection**

<b>Frequency of Waste Collection</b>	<b>% of Households in Maseru West (n=50)</b>	<b>% of Households in Sea-Point (n=40)</b>
<b>Never collected</b>	0	10
<b>Once a month</b>	5	10
<b>Once a week</b>	80	50
<b>Twice a week</b>	15	30
<b>Total</b>	<b>100</b>	<b>100</b>

n= sample size

The results obtained from the survey are shown in Table 4.8, which indicates the responses on the frequency of waste collection given by households who had refuse bins and who receive the Maseru City Councils services. Although the results indicate a more frequent collection of waste in Maseru West than in Sea-Point, during interviews with Maseru City Council officials, it was indicated that each ward is serviced only once a week, regardless of level of income of its residents. They indicated that the actual amount that is paid for the service is M 1.00 per month per refuse bin. This low charge is considered uneconomical MCC to provide this service to all areas at regular and accepted intervals and the system is not sustainable.

**Table 4.9: Methods of Waste Disposal in the Study Areas**

<b>Disposal Methods</b>	<b>% of Households in Maseru West (n=50)</b>	<b>% of Households in Sea-Point (n=40)</b>
Refuse bin	80	30
Burn	30	35
Bury	10	25
Dump outside the yard	0	40

n= sample size

Table 4.9 presents the information obtained from the survey with regard to waste disposal methods. Percentages do not add up to 100 because some houses employed more than one disposal method. Some families had bins but still burnt part of their waste or buried it so as to reduce the volume of waste going into the bins. The 80% and 30% of the households in Maseru West and Sea-Point, respectively have refuse bins corresponds with Table 2.1 where the refuse service collection coverage was found to be 80% in Maseru West and 30% in Sea-Point. The last three options for waste disposal i.e. burning, burying and dumping were preferred in Sea-Point where many families do not have refuse bins for several reasons, among which are the following:

- (a) Refuse bins were being stolen for brewing local beer.
- (b) People could not afford to pay the rates and to buy the refuse bins.
- (c) Dogs spill the refuse bins as most of the yards are not properly fenced.
- (d) The services rendered by MCC are not considered satisfactory by some people.

Although 80% of households in Maseru West have refuse bins, those few who do not have bins bury or burn their waste as alternative methods of disposal. Observations made during the fieldwork records illegal dumping to be a problem in Sea-point, confirming the literature which said that illegal dumping is a problem in most developing countries. As a result, Sea-Point has more problems with refuse in its neighbourhood than Maseru West, mainly because 70% of the households do not have bins and also because many houses are not fenced and dogs move around spilling the bins, scattering waste in Sea-Point (Plate 2). Basically, the City Council's services were considered unsatisfactory by the majority of people in Sea-Point, whereas the general consensus in Maseru West was that the services were good and satisfactory, resulting in Maseru's neighbourhood being relatively clean (Plate 1).

In general, "landfilling" is the officially used method of waste disposal in the entire country, even though illegal dumping, burning and burying of waste are sometimes used by those households who do not have refuse bins. As the literature has indicated, low income residential areas are the most littered due to inadequate services and poor

because they are densely populated. Consequently, the low income residential areas have a relatively poor degraded environment.



**Plate 4.1 A section of Maseru West**

Plate 4.1 shows a street in Maseru West. Most of the streets are similar to the one on the Plate. The streets are cleaner than those of Sea-Point because most households have refuse bins and almost all the stands are fenced. During the fieldwork it was noted that most of the houses in Maseru West are big, beautiful and clean. The residents are concerned in promoting market value for their estates by improving the appearance of their environment. The infrastructure is available in Maseru West such as, roads, electricity, water supply and sewer lines.



**Plate 4.2 A Section of Sea-Point**

Plate 4.2 shows a general (representative) view of Sea-Point residential area. It is shown on the picture that the streets are not as clean as in Maseru West because some households do not have refuse bins, thus litter is seen scattered around the streets as a result the appearance is poor. Most of the stands are not properly fenced nor are they properly demarcated. The infrastructure is not so good, many people do not have electricity, sewer lines and the roads are not tarred. Most people still use communal water taps because water is not available in every stand.

#### **4.2 Interviews**

Interviews were conducted with relevant officials at the Maseru City Council and the National Environment Secretariat. The intention was to assess the role played by each office in waste management from the council's/local authority's perspective.



#### 4.2.1 Maseru City Council

During the interviews, it was pointed out that MCC waste collection fleet consists of four Tip-Pak trucks, closed body non-compaction type of approximately 10 m<sup>3</sup> capacity and a trailer towed by a tractor. Of the four trucks, three are used for normal day-to-day routine while the fourth truck is on standby, used during breakdowns and emergencies. Each truck has one driver, one supervisor and ten labourers who load the refuse from house to house into the truck. The drivers work in shifts for eight hours a day. Thus, the MCC is still using a labour-intensive system of waste collection. Since the capacity of the trucks is small, the UNDP-NEYC project assists the City Council with waste collection in its own compactor truck on at least three days a week, from Monday to Wednesday.

Each truck has a specific route to follow. A door-to-door collection service is provided in the residential areas on a weekly basis only where there are good access roads. The service is provided once a person has made an application, has bought an 85 litre standard refuse bin and has paid M1.00 per month or M12.00 per year per refuse bin. It was pointed out that it is not compulsory for one to buy a refuse bin from the council, but the type of bin that one buys should meet the council's standard. Collection service maps showing the collection routes of the trucks and official data on frequency of collection from each area were not available.

Through an interview with Sanitation Officer of MCC estimation of waste coverage was made. The officer pointed out that the coverage was still the same as illustrated on Table 2.1, with changes in Maseru West where coverage has increased from 80% to 90%, in Maseru Central it has increased from 65% to 80%, *Thetsane*, including the industrial has increased from 50% to 90% and *Qoaling* used to be serviced but is no longer serviced. This has increased the number of unserviced wards from nine to ten. The reasons for not servicing some wards is simply a lack of planning and infrastructure. As a result, the refuse trucks are not able to drive through. The optional refuse removal system employed by MCC results in uneven and low (less than 100%) coverage since it is not binding. The

high percentages for Maseru West and Maseru Central confirms the literature which said that MCC's services are more concentrated in Maseru West and Maseru Central (MCC,1990).

#### **4.2.2 National Environment Secretariat**

The following NES staff were interviewed: The United Nations Volunteer (UNV) responsible for Environmental Impact Assessment and the Chief Technical Advisor (CTA) of National Environment Youth Corps (NEYC). During the interviews, the CTA stated that NES has established the youth corps project to activate and train youth in skills necessary for sound environmental rehabilitation and management and activities. He stated that in relation to waste management, NEYC had commissioned a baseline survey with the two objective of:

- (i) assessing the environmental impact of current waste management practices in the country, and,
- (ii) determining the possible amounts of recyclable generated for possible employment opportunities through collecting and selling recyclable waste.

The urban clean-up project started its work in June 1997 with four districts. It expanded to the remaining districts in 1998. The youth corps collects recyclables such as paper, bottles, plastic and cans and stockpiles them at designated areas. The aim is to increase the recovery rate which was recorded to be 0.63% (NES, 1997a) before the project started and to seek ways of establishing recycling plants in Lesotho. The wastes are not yet weighed because of lack of infrastructure to place weighing equipment.

Scrap metals are not yet collected because of inadequate infrastructure in terms of transportation and storage, but the project is looking for funds to buy a truck with a crane. The control of scrap metal disposal has to be given attention because of its implication on human health and aesthetics. Most of Lesotho's scrap yards are situated around residential areas, and these tend to overshadow the general beauty and "sense of place" associated with residential areas. The loss of aesthetic value/appearance has a direct

bearing on market value of a property and tourism. Furthermore, scrap cars and metal junk act as breeding sites for rodents and insects larvae. Although it may be argued that Lesotho is not prone to diseases such as malaria, the present span of global climate change suggests otherwise. According to the history of climate change in Lesotho, there is a likelihood of increasing temperatures in the country. On the other hand, rodents are known to be carriers of diseases such as plaque, with Lesotho having had a typhus epidemic in 1972, it calls for more concern on this issue.

NEYC has one compactor truck with the capacity of 19 cubic metres. The truck is used to transport the collected wastes from the districts to the main storage site where the wastes recycling plants would be located and where they are currently sorting and grading it for sale (Fig.4.2). The plant will be located at the industrial area nearer to the Maseru Bridge and the Caledon River.

### 4.3 Field Inspection

As indicated in the previous chapter, Maseru has only one refuse disposal site or tip-site, which is an abandoned quarry situated at the Lancer's Gap in the village called "*Ha Tsosane*" and known as "*Tsosane disposal site*" (Plate 4.3). This is on the east of the city, about 4 kilometres from the city centre (Fig 3.2). Despite the security fence surrounding the site, the security is still not good as the gate is left open and there are many scavengers going into the site each day collecting recyclables for individual or business trading. It was observed that site supervision was weak, with little control of what types of refuse are deposited on different parts of the site and private hauliers use their own judgement as to where to dump their waste.

Although, there are no statistics on the percolation of leachate from the disposal site into the main source of water, it is possible that there is some percolation as the disposal site is located above the two lakes which supply Maseru city with drinking water. Lesotho in this case is compared with Zambia where there are no safeguards in place to protect surface and groundwater pollution through wash away and leachate and there are no measures taken to guard against smell in the disposal site.



**Plate 4.3 *Tsosane* Disposal Site**

Plate 4.3 shows *Tsosane* disposal, which is situated within a neighbourhood and is not properly managed. It is likely that the disposal site has a serious problem of natural fires which appears unabated at all times because of high level of methane produced from waste. Thus, the smoke coming from this becomes a nuisance to the residents of *Ha Tsosane*, especially those staying on the eastern side of the site. As a result of this, respiratory problems are possible amongst the people adjacent to the site.

Besides the smoke, the disposal site produces a nasty smell coming from the rotten biodegradable waste. It has been observed that there are many flies at the site and around in the houses adjacent and that the site is a breeding place for rodents. The situation becomes worse in summer.

These problems could be mitigated by covering the waste with soil, thus making it air tight. The Senior Environmental Health Officer for Maseru City Council explained that the covering is done once a year, depending on the availability of funds to hire a bulldozer and a compactor to do the covering and compaction respectively.

In order to address these problems, the Maseru City Council together with Committee on Waste Management (COWMAN) commissioned an audit of the disposal site. The site was found to be unsuitable for waste disposal. The site is located at the middle of a residential area and it is about five hundred metres away from the catchment of main reservoir which supplies the city with water. Worst of all, the reservoir is situated on a slope below the dump site, resulting in surface run-off from the site being transferred into the dam. Based on these problems, the Audit Report strongly recommended that the disposal site be closed and rehabilitated and an alternative site be found. As a follow up to this, MCC assigned an alternative site at *Likotsi* on the south west side of the city (Fig.2.1)

An inspection of this site was done by members of COWMAN and the site was found appropriate, despite the fact that a proper Environmental Impact Assessment is still to be done. The National Environment Secretariat has approached the Danish Cooperation for Environment and Development (DANCED) to assist in funding a project on waste management in Lesotho, amongst which the construction of sanitary landfills in Maseru and other districts is a priority.

#### **4.4 Discussion**

The changing human behaviour towards environment demands a creation of circumstances under which the new behaviour is seen as being rational. People have to accept that littering and illegal dumping is unsuitable for their lives and should not be tolerated. It is essential to assess and analyse the causes of waste and how they can be minimised before one can look at disposal. Thus, in dealing with waste management it is important to know, among other things, the source and type of waste and the quantity of waste an area produces. Analysis of the strategies for collection and disposal of waste should then follow.

The volume of waste currently generated in Lesotho, together with the emerging demand of recyclables and the high level of unemployment and impoverishment, has resulted in the emergence of refuse scavenging as an environmental and economic activity. Some

earn M200 -M300 per month through salvaging paper, cans, plastic, glass, cloth off-cuts and many more items that are recyclable and reusable.

The results of the study survey in the two areas undertaken in this research indicate that waste generation rates vary with income level in Maseru, i.e. high income residential areas produce more waste than low income residential areas. Therefore, income and consumption levels determine the amounts of waste generated by a particular area. A strong relationship between gender of the household head, level of education of the household head, income level of the household, household size and waste generation was found. The results coincide with the reviewed literature in that, wealthy people generate more waste than the poor and all hypotheses which were put forward in this study were confirmed.

For waste management to be effectively implemented, separation of waste at source is essential. But, while separation at source is widely acceptable as the most environmentally viable and efficient solution for waste management, it will take time, in terms of cost, education and changing existing collection systems for separation at source to operate effectively in Lesotho. Consequently, more education and awareness on the issues pertaining to waste separation, minimisation and disposal are needed.

Although the present refuse storage regulations requiring households to have standard refuse bins are theoretically satisfactory, they are not practised and no serious efforts have been made to see that the regulations are enforced. The cost of refuse bins is high and not affordable by the low income groups and the payment terms are not efficient as one has to travel a long distance to pay. Lesotho has honoured its obligation to protect its environment by giving waste management a priority in the Agenda 21 for Lesotho. This was discussed on the National Workshop for the Implementation Review of Agenda 21 in Lesotho which was held at Maseru Sun Cabana on the 24-26 June, 1998.

## CHAPTER 5

### 5. CONCLUSION AND RECOMMENDATIONS

#### 5.1 Limitations of the Study

The study was conducted during the dry seasons when little gardening was done, as a result not much organic waste was collected. There were no safe places to store the bags so as to protect them against dogs, which seemed to be the most problem in unfenced or inadequately fenced houses in both areas especially in Sea-Point. This problem led to a decrease in the number of bags retrieved. Another problem that hindered the collection was that some households were not comfortable with a once a week refuse collection because they thought the week is too long, hence the food will rot and produce a bad smell and become a breeding place for flies. In fact, not much organic waste was collected, the reason being that it is used for feeding animals, such as dogs, chickens, sheep, etc.

Out of 50 questionnaires distributed in Sea-Point only 30 were recovered after a week, and 10 were recovered two weeks later, reasons being that the person in charge was busy, he was away for the whole week, he forgot, etc. In Maseru West, the recovery was better because at least 50 out of the 60 questionnaires were recovered after a week.

#### 5.2 Conclusion

The increasing population of Maseru, together with the change in life-style, has altered the nature of waste and increased the amount of waste generated. For instance, the population of Maseru in 1986 was estimated to be 109 382 and this has increased to 385 869 in 1996, showing an increase of 276 487 (Population census, 1996). This has been accompanied by a drastic increase in waste generation which used to be 1 683 tonnes in 1987 and has been estimated through projections to have increased to 5 892 tonnes in 1996. This change has, however, not been accompanied by a proportional increase in services. According to the 1987 study, the services of the Maseru City Councils have remained the same, i.e. four trucks have been used to serve the whole city and this is still the case at present.



The situation is becoming worse since the trucks have not been replaced and they are getting old and are having technical problems.

This chapter looks at how waste could be effectively managed and used economically in more environmentally friendly ways in order to assist poor people to generate their own income and to minimise the generation of waste so as to extend the life of the landfills. It puts forward, as recommendations and possible strategies, solutions and ideas that could be implemented in order to improve the current waste management practices in Lesotho so as to achieve a sustainable waste management system in the country.

The study set out to do the following: to compare and analyse domestic solid waste management in high and low income residential areas of Maseru, to determine if there were disparities in the services offered by the City Council. It focussed mainly on domestic waste, excluding garden waste, which requires frequent disposal because of spoilage.

The results suggest that income has a direct and negative bearing on waste generation and this in turn depends on the level of education of the household head. Based on dependency ratio and cash available *per capita*, it was concluded that households in Maseru West are wealthier than those in Sea-Point. The similar observations about the relationship between income and waste generation was made in Zimbabwe by Tevera in 1991. The standard of education largely determines the level of income of a household. Maseru West was found to have more educated and elite people than Sea-Point. The number of people per household was also used as a parameter to determine waste generation. It was therefore, found that waste generation is directly related to the number of people. The gender of the household head was found to have a direct influence on the level of poverty and thus the generation of waste. Female headed households with a single means of income are associated with poverty and less waste generation.

In general, the standard of waste disposal in Lesotho is very poor due to lack of adequate equipment necessary for collecting and transporting waste because Maseru City Council



is facing serious financial constraints. Lack of urban planning and infrastructure is exacerbating the problem. Although, the frequency of waste collection rendered by the Maseru City Council was found to be the same in both study areas, collection coverage was found to be greater in Maseru West than in Sea-Point.

It is, however, not acceptable to believe that waste is a fact of life and that management must consist of disposing of an ever increasing mass of waste without doing something to mitigate the problem. It is therefore necessary that all factors that might contribute to waste production be analysed, evaluated and incorporated into an effective waste management strategy.

Taking into account the finite nature of natural resources, it is becoming increasingly important to appreciate the role that recycling is likely to play. Recycling projects not only ease pressure on diminishing resources, but can act as an employment opportunity taking into account the 31% unemployment in Lesotho.

Industrialisation is highly desirable for Lesotho, but without proper planning and controls, it will bring increased risk of pollution. Urban development without proper planning in Lesotho has resulted in careless disposal of wastes such as motor car wreckages, paper, plastic, cans, bottles and many others. It has also resulted in the disposal of these into rivers and dongas which are used as sources of drinking water. This results in increased health hazards and consequently spread of diseases. Any development which does not take into account the protection of the environment is not sustainable.

### 5.3 Recommendations

The following recommendations are made based on the key findings discussed in the previous chapter.

1. There is clear evidence from the study that the current waste management practices in Maseru, or even the entire country need to be improved. These require a multi-disciplinary approach which integrates economic, environmental, educational, legal and administrative sectors.

2. A holistic approach on waste management between private sectors, line ministries, non-governmental organisations, councillors and other stakeholders is needed, as this problem is not one man's job.
3. With regard to lack of employment opportunities in Lesotho, waste could be used and managed more effectively in order to generate job opportunities especially amongst women and the youth. This involves putting more emphasis on recycling materials so as to stimulate the informal the sector, i.e. the individuals who live by selling the recyclables to the recycling agents. Using waste for recycling purposes and re-using it will mitigate the increasing unemployment problem. Therefore, recycling or re-use of waste materials should be integrated into the waste management decision-making. This will help to avoid the rising costs of disposal of waste material.
4. Steps must be taken to develop economic and environmentally acceptable methods of waste disposal. These should be accompanied by a commitment to reducing the quantities and types of waste generated at source. Community involvement in waste collection programmes, re-use and recycling is essential and this should be a national strategy.
5. In order to exercise tighter controls over siting, monitoring and rehabilitation of landfills, the government should introduce a permit system for waste disposal sites and an Environmental Impact Assessment, and there should be a law governing the siting of a dump site/landfill.
6. Although not much of hazardous waste is produced, there should be a special landfill for hazardous waste because the chances of it to increase are very high due to increasing industrialisation.
7. The Maseru City Council should institute proper controls at the gate of the disposal site/landfill to monitor the amount and type of waste getting into the site. This simply means that a weighing bridge is needed at the gate and tariff should be paid at the gate by people bringing waste.

8. Public education and awareness on waste management issues and an understanding of the respective roles of the community, the business sector and the local authorities, is essential for the implementation of effective waste management. Thus, public awareness should be seen as an integral component of a successful waste management programme, as it is essential for communities to be involved in the decision making from the beginning though to the implementation stage.
9. Local authorities should encourage and develop community-based initiatives as well as waste minimisation programmes so as to reduce overall tonnage. This should encourage the minimisation guidelines suggested by Gerrans (1994).
10. There is a need to improve urban planning and the road infrastructure, especially in the wards that are serviced by Maseru City Council, to enhance collection, and to extend the waste collection services to the other wards around the city and to the peri-urban settlements.
11. The government should consider additional resources to support municipal and local authorities in addressing environmental conditions conducive for the urban poor, i.e. the government should develop policies, legislation, laws and regulation in order to enhance the work of MCC. Polluter pays principle should be implemented.
12. The City Council should purchase the refuse bins in large quantities and give them to the residents. Cost recovery could be achieved by adding the equivalent annual cost of the container to the annual service charges.
13. Ownership of bins and availing oneself to the MCC should not be optional but mandatory, with a suitable payment scheme. Less than 100% coverage of an area is not good enough.
14. A clause should be amended on the Environmental Bill which stipulates clearly

regulation or law.

15. The Environmental Bill should state clearly role of the municipality, communities and the various enterprises involved in waste management should be clearly defined and co-ordinated so that whoever is not doing his job could easily be followed up.
16. The Environmental Bill should stress a partial separation at source for recycling purpose. Producers should be advised to try as much as possible to produce recyclable materials and packagers should avoid over packaging as a means of waste minimisation.
17. Although the National Environment Secretariat has formulated the Environmental Bill, a comprehensive waste management policy should also be formulated in order to avoid dealing with waste materials in different, fragmented laws. The process of waste management policy formulation will facilitate the promulgation of waste management legislation and accompanying regulations. These should enforce environmental education and awareness; and ensure that environmental impact assessments are done before any big project is implemented.
18. For efficient waste management and for future planning, collection of statistical data about waste generation rates in Maseru and other districts of Lesotho is needed. At present it is difficult to effectively come up with strategies because it is not known how much waste is generated in Maseru or what *per capita* waste generation levels are.
19. What is essential for the sustainable waste management, is a complete re-evaluation of the implications of waste and the re-orientation of individuals's perceptions about waste. This can then be incorporated into the broader vision of sustainable development.

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**APPENDIX****QUESTIONNAIRE**

YOU ARE REQUESTED TO ANSWER THE QUESTIONS IN THIS QUESTIONNAIRE. THE INFORMATION OBTAINED WILL BE PUT TOGETHER AND SHARED WITH THE RESPONDENTS, THE MINISTRY OF LOCAL GOVERNMENT AND THE UNIVERSITY OF NATAL, PIETERMARITZBURG. THE INFORMATION WILL REMAIN ANONYMOUS AND CONFIDENTIAL. YOUR CO-OPERATION WILL BE APPRECIATED.

**please tick the correct answer**

1. Household head.

- 1. Male
- 2. Female

2. Highest standard of education of household head.

- 1. Primary
- 2. Secondary (JC)
- 3. High School (COSC)
- 3. Tertiary (specify)

3. Number of people in the household

- 1. One
- 2. Two
- 3. Three
- 4. Four
- 5. More than four (specify)

4. Number of people working in the household.

- 1. None
- 2. One
- 3. Two
- 4. Three
- 5. More than three (specify)

5. Total income per household per month (i.e. How much money do you get per month?)

- 1. Below M500
- 2. M500 - M999
- 3. M1 000 - M1 499
- 4. M1 500 - M2 000

5. Above M2 000

6. Other (specify)

6. How often is your waste collected?

1. Never

2. Once a week

3. Once a very two weeks

4. Once a month

5. Other (specify)

7. How much do you pay for waste services per month?

1. Less than M5. 00

2. Less than M10. 00

3. More than M10. 00

8. If never, how do you dispose your refuse?

1. Dump

2. Burn

3. Other (specify)

9. Do you separate your waste for any purpose?

1. Yes

2. No

If yes give reason -----

-----

10. If 8 above is yes how? -----

-----

11. Do you use any of your refuse to make compost?

1. Yes

2. No

12. If 10 above is yes how often?

1. Once a week

2. Once a month

3. Once a year

4. Other ( specify)



13. Do you sometimes buy fertilisers for your garden?

- 1. Yes
- 2. No

14. Do you separate any of your waste for recycling?

- 1. Yes
- 2. No

15. If 13 above is yes, what do you separate?

- 1. Cans
- 2. Plastic
- 3. Other (specify)

16. Do you think there are any problems with refuse and waste in your neighbourhood? Explain

-----  
-----  
-----

17. Would you be prepared to separate your refuse into different bags for collection?

- 1. Yes
- 2. No

give reasons -----  
-----

18. Do you grow a vegetable garden?

- 1. Yes
- 2. No

If no why not? -----  
-----

19. How are the services provided by the municipal?

- 1. Poor
- 2. Fair
- 3. Good
- 4. Excellent