# THE VIABILITY OF ESTABLISHING SOLID WASTE BUY-BACK CENTRES

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# LIST OF ABBREVIATIONS

DEAT – Department of Environmental Affairs and Tourism
GDACE – Gauteng Department of Agriculture, Conservation and Environment
IDP – Integrated Development Plans
ISD – Infrastructure and Services Department
IWMP – Integrated Waste Management Plan
NEMA – National Environmental Management Act
NWMS – National Waste Management Strategy
SOER – State of Environment Report
Stats SA – Statistics South Africa
The City – City of Johannesburg
WIS – Waste Information System

# ABSTRACT

The City of Johannesburg is facing the simultaneous challenges of an increased generation of solid waste in the City, unemployment and the running out of land to dispose the waste. Of the solid waste that is generated, 50% is recyclable while only 10% is recycled (SOER, 2003: 69). Solid waste recycling is mainly performed through private sector initiatives in the City of Johannesburg. Consequently, there is no proper co-ordination with government initiatives.

In order for South Africa to increase and sustain economic growth that would decrease unemployment, there should be a culture of entrepreneurship (Mass, G & Herrington M, 2006:7). Solid waste buy-back centres assist in addressing the challenges of dealing with the increased generation of solid waste and the scarcity of land for disposal. These centres also reduce the challenges of unemployment through promoting entrepreneurs to operate solid waste recycling businesses.

Developed economies have managed to increase the rate of solid waste recycling to 60%. The problems associated with solid waste have been reduced by promoting recycling through a combination of legislation and setting-up of agencies to deal with solid waste recycling. South Africa has legislation and stated programmes to deal with solid waste recycling. Nevertheless, there has been complexity with implementing recycling. This is the result of a lack of co-ordination between the role-players involved in the value chain of solid waste recycling.

In order for the City of Johannesburg to increase the recycling of solid waste from 10% to optimal rates of between 50% and 60%, there should be co-ordination of programmes amongst all the role players. In addition, there should also be skills provision to existing and potential entrepreneurs operating the solid waste buy-back centres. All spheres of government should promote solid waste recycling business to potential entrepreneurs and the public in order to recycle 40% of the recyclable solid waste that is not being recycled.

The establishment of a solid waste buy-back centre in the City of Johannesburg is economically viable with some buy-back centre realising a net-profit of least R 5 000 and some more than R30 000 per month. In order for the solid waste buy-back centre to realise a net-profit of more than R30 000 per month, there must be more than 40 tons of recyclable solid waste received by the buy-back centre per month. This study has indicated that solid waste buy-back centres rely on the economies of scale. This means

that the more recyclable solid waste is received and sold by the solid waste buy-back centres, the more profitable it becomes.

**Key words:**
Solid-waste
Buy-back centre
Recycling
City of Johannesburg

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# CHAPTER 1: NATURE AND SCOPE OF THE STUDY

## 1.1 INTRODUCTION

Solid waste recycling consists of a number of value chain activities, such as separation of waste into recyclable material and non-recyclable material, collection, and transportation of the recyclable solid waste material to a central distribution point, that is to say solid waste buy-back centres. The solid waste buy-back centres purchase the recyclable solid waste material from collectors of recyclable solid waste material and then sell the recyclable solid waste material to industries, such as the manufacturers of paper, plastics, cans and glass. The solid waste buy-back centre can be described as a place where communities bring recyclable waste material in exchange for money.

Solid waste buy-back centres play a pivotal role within the waste recycling value chain as it is an important link between the collectors and buyers of recyclable waste material. For this reason, this research will focus on factors that concern the generation and recycling of solid waste material. Such factors affect the quantities of solid waste that are purchased and sold by the solid waste buy-back centres in order to realise economic viability. Solid waste buy-back centres benefit public in four ways: provision of income to the entrepreneur operating the solid waste buy-back centre; provision of income for the people collecting and bringing the recyclable solid waste material to the buy-back centres; assisting the local government in saving on solid waste disposal costs; and reduction of environmental problems associated with waste disposal.

This study will discuss the recycling of paper, cardboard, tin, glass and plastics, the term "solid waste" will be used for the purpose of this research implying waste that is normally disposed. The study area will be limited to the City of Johannesburg, which will also be referred to as "the City". The main reasons for limiting the research to these identified solid waste types and to Johannesburg are as follows:

- Solid waste aspects such as recycling are part of the current focus on environmental issues world-wide.
- According to the SOER (2003:69), solid waste is easily recyclable. Approximately 50% of the solid waste is generated in the City of Johannesburg and other metropolitan cities in South Africa such as Ekurhuleni, Cape Town and Ethekwini.
- The levels of solid waste recycling in Johannesburg are as low as 10% when benchmarked against trends in developed economies which are at 60%. Recycling in the City is mainly done through informal and private sector initiatives. There is an opportunity for private entrepreneurs to generate income from recyclable waste. The generation of solid waste keeps on increasing as a result of population growth, increase in the levels of disposable income by residents of Johannesburg and also by the trend of urbanisation (SOER, 2003:69).
- The City is experiencing a problem with regard to the availability of land to dispose of waste (landfill) as it is the most densely populated province in South Africa (SOER, 2003:69).
- The recycling of solid waste presents entrepreneurs with the opportunity of establishing a solid waste recycling business (a solid waste buy-back centre). In addition, the City of Johannesburg is given the opportunity to reduce the problems with landfill space; and
- The researcher is currently an employee of the City of Johannesburg.

The research should contribute on policy direction and strategies to stimulate the solid waste recycling business. The research also creates opportunities for further investigation of solid waste disposal. In the next section the problem statement is discussed.

## 1.2 PROBLEM STATEMENT

According to Mass & Herrington (2006:23), entrepreneurial activity in South Africa is ranked at number 32 when compared to 42 other countries in the world. Entrepreneurship contributes significantly to job creation. Stats SA (2007) reports that unemployment in South Africa stood at 25.5% in 2006, with Gauteng at 23.3%. In order for South Africa to increase and sustain economic growth that

would decrease unemployment, a culture of entrepreneurship needs to be promoted (Mass G & Herrington M, 2006:7). There are entrepreneurial untapped opportunities within the solid waste recycling industry such as the establishment of solid waste buy-back centres that can contribute to economic growth and reduction in unemployment.

The average annual population growth in the City of Johannesburg is 2.5% (SA Cities Network, 2007). This population growth and the urbanisation trend result in the increased generation in the quantities of solid waste. This challenges the City's ability to provide waste management services. According to the SOER (2003:69), the City generates 1.6 million tons of waste annually and this figure is expected to rise to more than 1.7 million tons by the year 2010. The highest volume of waste generated per day is 1.7 kg per individual which is in line with other metropolitan cities in South Africa.

Over 50% of waste generated in the City is recyclable. The current levels of recycling within the City are low (estimated at less than 10% of the waste). The recycling of waste is mainly the result of the informal or private sector initiatives. There are untapped opportunities for small business development, job creation and poverty alleviation initiatives linked to waste recycling (SOER, 2003:70). The City of Johannesburg Integrated Developrnent Plans (IDP) is to promote the creation of small business enterprises in order to alleviate poverty and decrease unemployment. Solid waste buy-back centres can assist in achieving this goal. Waste is often perceived as something to be discarded, rather than a resource that can generate income or wealth. Mass & Herrington (2006:18-19) assert that a paradigm of entrepreneurship is lacking in South Africa. The expectation is that big businesses, government and others should create jobs, rather than people creating self-employment and jobs. In order for South Africa to address the challenge of unemployment, there needs to be a paradigm shift when it comes to entrepreneurship.

The solid waste landfill sites within the City are expected to reach half-life by 2010 if the levels of recycling are not increased (SOER, 2003:69). The City of Johannesburg should therefore be encouraged to recycle solid waste. Besides saving landfill airspace, the City will also be saving in terms of disposal costs.

The above demonstrates that there is an opportunity to address the problems of unemployment and waste disposal in the City through solid waste recycling initiatives such as solid waste buy-back centres. Moreover, there is a growing world-wide concern for the "GREEN" management of the environment and this study should contribute to alleviating this concern. This study will therefore mainly focus on factors that lead to increased recycling and those that support the market for establishing solid waste buy-back centres and realises the business imperative of economic viability. The hypothesis with regard to the study is stated in the next section.

## 1.3 HYPOTHESIS

The establishment of a solid waste buy-back centre is economically viable because there is 40% of recyclable solid waste that is not going through the solid waste buy-back centres and is currently being disposed of at the landfill sites. The purchase and selling of these 40% recyclable solid waste by the solid waste buy-back centres can result in the business of establishing a solid waste buy-back centre being a viable business. The viability of establishing a solid waste buy-back centre can be enhanced through legislation and strategic support by government. The objectives of the study are discussed in the next section.

## 1.4 OBJECTIVES

### 1.4.1 Primary Objectives

The primary objective of this study is to determine the viability of establishing solid waste buy-back centres.

For the purpose of this research, viability will be defined as a business that generates net-profit and has growth potential.

### 1.4.2 Secondary Objectives

- To investigate whether there are incentives for government and entrepreneurs to establish solid waste buy-back centres in the City.
- To investigate the economic disincentives for establishing a solid waste buy-back centre business in the City.
- To identify the gaps that can hinder solid waste recycling being a viable business.
- To provide recommendations on support structures and mechanisms required to establish a viable solid waste recycling business.
- To identify potential policy interventions for the City to adopt in order to encourage the solid waste recycling business; and
- To spell out managerial implications with regard to the viability of establishing a solid waste buy-back centre.

The scope and limitations of this study is discussed in the next section.

## 1.5 SCOPE AND LIMITATIONS

The study will be limited to the recycling of paper, glass, cardboard, tin and plastic. The study will attempt to benchmark solid waste recycling best practices in the world against solid waste recycling practices in the City of Johannesburg.

The empirical study will be limited to a representative sample of more than 50% of the entrepreneurs operating solid waste buy-back centres in the City.

The primary study area will be limited to the City of Johannesburg as the researcher is currently working for the City of Johannesburg Metropolitan Council. The terminology used in the study is defined in the next section.

## 1.6 TERMINOLOGY IN THE STUDY

a) **Buy-back centre** – A Buy-back centre is a place where people bring in recyclable waste for collection and are paid for the recycled waste that is

brought in (Department of Environmental Affairs and Tourism, SA, 2003(a):17).

b) **Landfill site** - A landfill site is a disposal site for community solid waste that is sited, designed and operated to protect the health and safety of humans and the environment. Waste is typically deposited in layers and compacted, then regularly covered with a layer of soil or cover material (Public Works and Government Services Canada, 2008).

c) **Recycling** can be defined as "the process whereby discarded products and materials are reclaimed or recovered, refined or reprocessed, and converted into new or different products". (Department of Environmental Affairs and Tourism - Guidelines on recycling of solid waste, 2003 (a): 3)

d) **Solid waste** implies waste that can be accepted for disposal in a landfill or incinerator and typically includes food waste, paper and cardboard, yard waste, glass, metals, plastics, and so forth. Typically it does not include industrial waste, medical waste, or hazardous waste (Public Works and Government Services Canada, 2008).

e) **Waste** - In terms of the Draft Waste Management Bill (SA, 2006:12) "waste" is defined as any substance, whether solid, liquid or gaseous, which is:

- discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration to the environment,
- a surplus substance or which is discarded, rejected, unwanted or abandoned,
- re-used, recycled, reprocessed, recovered or purified by a separate operation from that which produced the substance or which may be or is intended to be re-used, recycled, reprocessed, recovered or purified; or
- Identified as waste as prescribed by regulation.

The research methodology followed in the study is discussed in the next section.

## 1.7 RESEARCH METHODOLOGY

The research will follow a quantitative descriptive research approach where the first part will be a literature review on solid waste recycling practices in the developed economies and in South Africa, especially pertaining to the City. The literature review will be followed by an empirical study that will interview the entrepreneurs operating solid waste buy-back centres.

### 1.7.1 A broad literature review

The literature study will focus on the following:

- History on solid waste recycling in the developed economies.
- Legislation on solid waste recycling in the developed economies.
- South African legislation that affects solid waste recycling.
- South African government documents that affect solid waste recycling.
- Legislation and policies in the City of Johannesburg affecting solid waste Recycling.
- Trends on solid waste recycling in developed economies and South Africa.
- Environment and the economics.
- Infrastructure required to run a solid waste recycling business.
- Integrated Development Plans with regard to solid waste recycling; and
- Solid waste recycling programmes and projects in the City of Johannesburg.

### 1.7.2 An empirical study

#### 1.7.2.1 Primary data collection

A questionnaire will be developed and entrepreneurs operating buy-back centres will be interviewed in order to gain more insight on the profile of entrepreneurs, and the successes and challenges in operating a solid waste buy-back centre business. The questionnaire will have open-ended and categorical questions. The questionnaire will focus on the following themes; the profile of entrepreneurs, geographic profile on the location of buy-back centres, institutional support

mechanisms, infrastructure analysis, market and profitability analysis and other general aspects.

In the next section the layout of the study is discussed.

## 1.8 LAYOUT OF THE STUDY

### CHAPTER 1: NATURE AND SCOPE OF THE STUDY

In this chapter the problem statement with regard to why the study is undertaken is discussed, the hypothesis stating that the establishment of a solid waste buy-back centre is viable is stated, the primary and secondary objectives of the study are also stated, the scope and limitations of the study and the research methodology followed in the study are discussed as well.

### CHAPTER 2: A GLOBAL PERSPECTIVE ON SOLID WASTE MANAGEMENT AND RECYCLING

The legislation in the developed economies of the United Kingdom and United States will be discussed in this chapter. Perspectives on solid waste, factors affecting solid waste recycling, and problems associated with improper solid waste disposal, benefits of solid waste recycling, financial considerations for a solid waste buy-back centre, market efficiency to improving solid waste recycling and the economic instruments to enhance solid waste recycling will be discussed.

### CHAPTER 3: LEGISLATION AND POLICIES AFFECTING SOLID WASTE MANAGEMENT AND RECYCLING IN SOUTH AFRICA

In this chapter the legislation and policies affecting solid waste management and recycling in South Africa and the City of Johannesburg will be discussed. The state of each recyclable solid waste material under study (paper, glass, plastics and cans) will also be discussed. Lastly solid waste recycling within the City of Johannesburg will be discussed in this chapter.

**CHAPTER 4: THE VIABILITY OF ESTABLISHING SOLID WASTE BUY-BACK CENTRES**

In this chapter the research methodology with regard to the collection of the empirical data and the survey results on the viability of establishing solid waste buy-back centres will be discussed.

**CHAPTER 5: CONCLUSION AND RECOMMENDATIONS**

In this chapter the conclusions of this study, some implications for management and recommendations will be discussed. The next section discussed the summary of chapter 1.

## 1.9 SUMMARY

The research on the economic viability of establishing a solid waste buy-back centre is expected to provide more insight on the benefits of solid waste recycling, practices in the developed economies with regard to solid waste recycling and trends in solid waste recycling. The results of the study are expected to provide entrepreneurs seeking to establish a solid waste buy-back centre with an indication whether it is economically viable (business producing a net-profit or not and if there are growth potential to the business). The results of the study are furthermore expected to provide the management of the City of Johannesburg with general guidance on what policy interventions to adopt in order to support the establishment and growth of the solid waste buy-back centre industry. In the next section the global perspective on solid waste management and recycling are discussed.

# CHAPTER 2: A GLOBAL PERSPECTIVE ON SOLID WASTE MANAGEMENT AND RECYCLING

## 2.1 INTRODUCTION

The Department of Environmental Affairs and Tourism (2003(a):11) state that, in order for a solid waste buy-back centre to be profitable, there must be enough quantity of recyclable solid waste within the waste (that is to say at least 30%) and active participation in recycling programmes by the community. For this reason, Chapter 2 focuses on factors that generate enough recyclable solid waste material and promote optimal recycling.

Chapter 2 covers international legislation and policies governing solid waste management and recycling. The aim is to shed light on how legislation has historically influenced and continues to have an effect on the management of solid waste and recycling in the United Kingdom (UK) and United States (US), as this countries are perceived to be more developed countries in the world. The research on international legislation will benchmark international solid waste recycling best practices against the South African context in the next chapter. The waste legislation that is covered is from a period prior to the formal adoption of solid waste recycling, to be exact from the late 1960s to 2008. The study of solid waste legislation will assist in determining how legislation affected solid waste recycling.

Chapter 2 provides a general perspective on solid waste management and studies recycling by investigating the status quo on solid waste management and recycling from a global perspective, factors affecting solid waste recycling, benefits of solid waste recycling, financial considerations and economic instruments that would facilitate recycling. The research aims to shed light on what factors promote and hinder the optimal recycling of solid waste. An awareness of this will form the basis of designing proper intervention measures to facilitate optimal recycling of solid waste.

Chapter 2 also discusses the historical trends with regard to solid waste management and recycling in order to determine whether problems associated with solid waste management and recycling are improving, and also what factors led to improved levels of solid waste recycling.

In the first section that follows, the international legislation will be discussed.

## 2.2 LEGISLATION GOVERNING SOLID WASTE MANAGEMENT AND RECYCLING IN THE DEVELOPED ECONOMIES

This section discusses waste legislation in developed economies that promote the recycling of solid waste in the UK and US. Developed economies' recycling initiatives have existed long before recycling was considered by developing economies (Anderson, 2004:178). In chapter 3, the discussion will benchmark South African legislation affecting solid waste recycling against solid waste legislation in developed economies. This is important as South Africa is striving to be a developed economy.

### 2.2.1 European legislation impacting on solid waste recycling

According to Waste Online (2008), legislation on waste originally in the late 1960s focussed on the disposal of waste such as the Directive on Waste 75/442/EEC which was amended in 1991 to address issues of waste recycling. The following two directives from the European Union directly influence solid waste recycling according to (Waste Online, 2008).

#### *2.2.1.1 Directive on Waste 75/442/EEC (Waste Framework Directive)*

This directive on Waste 75/442/EEC was first published in 1975 and it establishes the overall framework for the management of waste across the European community. The directive covers definitions and principles to ensure that a uniform approach is followed across the European Union on waste management. In addition, the directive requires members' states of the European Union to prioritise waste prevention and encourage the re-use and recovery of waste.

In addition to the waste legislation that has been developed in the United Kingdom "UK", a National Waste Strategy has been developed by the UK government and the National Waste Strategy outlines how the UK intends to manage the increasing amount of solid waste generated each year. The UK is used as an example as it is considered one of the most developed countries within the European Union and since it provides insight on how solid waste legislation, that promotes recycling within the European Union, has advanced.

According to Waste Online (2008), the UK National Waste Strategy aims to reduce the landfilling of solid waste from the 1998 levels of 42 million tons per year to 36 million tons per year by 2005. This represents a reduction of 15% over the period.

In order to achieve this 15% reduction, the strategy specifies recycling and composting target rates for the local authorities. The composting and recycling targets are set for 2003 and 2005 using 1998/99 as a baseline. The targets intend to raise the national recycling rate for local authorities to 25% by 2005/06 and the overall targets reached in 2008 are 40%. One of the instruments that have been mentioned in the strategy is to increase landfill disposal tax by about 3 pounds per ton in 2005/06 on the way to a long-term rate of 35 pounds per ton; the money raised from waste disposal tax is used for other recycling programmes such as establishing new buy-back centres.

In the next section the second directive that affects solid waste recycling will be discussed.

#### *2.2.1.2 Directive on Packaging and Packaging Waste 94/62/EC*

The Packaging and Packaging Waste Directive 94/62/EC aims to harmonise measures pertaining to the management of packaging and packaging waste. In particular, it obligates companies within the European Union to meet targets for the recovery and recycling of packaging waste.

The Directive deals with the following key areas:

- Setting targets for the recovery and recycling of package waste.

- Encouraging the use of recycled packaging materials in the manufacturing of packaging and other products.
- Leading packaging to comply with 'essential requirements' which include the minimisation of packaging volume and weight, and the design of packaging to permit its re-use or recovery; and
- Implementing measures to prevent packaging waste (in addition to preventative measures under the 'essential requirements', including measures to encourage the re-use of packaging).

The target agreed by the European Union to be met by the 31st December 2008 is the overall recovery target of 60%. The material specific targets for each packaging material as per the Directive are summarised in table 2.1:

**Table 2.1. Recovered Packaging material targets for the European Union**

| Packaging material | Material specific targets |
|---|---|
| Glass | 60% |
| Paper | 60% |
| Metals | 50% |
| Plastics | 22.5% |

These targets are based on incremental recycling rates that aim to reach overall optimal recycling rates of 80% after 2010.

According to Letsrecycle.com (2008), the UK government has introduced the Producer Responsibility Obligations (Packaging Waste) Regulations 2005 as one of the measures to reach these targets. These regulations affect any company involved in the packaging supply chain that has a turnover larger than 2 million pounds, or which handles more than 50 tonnes of packaging each year. These regulations require companies to carry out producer responsibility by purchasing the Packaging Waste Recovery Notes (PRNs) or Packaging Waste Export Recovery Notes (PERNs) to meet obligations, which depend on how much packaging is put on the market.

The PRNs and PERNs specify the percentages of packaging waste that each business handling packaging waste must recover and / or recycle in a year. The regulations state the following percentages that must be recovered by each party: manufacturer: 6%; converter: 9%; packer / filler: 37%; seller: 48%; secondary provider: 85% and service provider: 85%.

The PRNs / PERNs are implemented in the following ways:

a) The affected companies must register with the relevant government agency dealing with the registration of PRNs / PERNs.
b) The affected companies must recover and recycle the specified tonnages of packaging waste.
c) The companies must provide a certificate to the agency stating whether the recovery rates have been achieved; and
d) Businesses whose main activity is "selling" must provide consumers with information pertaining to recycling packaging waste.

The above regulations form an offence for companies who do not reach these targets and compliance is enforced by the Environment Agency. These regulations have been complied with as evidenced by the increase in the overall levels of solid waste recycling, that is from around 10% prior to promulgation of the Regulations to more than 40% in 2008. Market forces of supply and demand determine the prices of PRNs and PERNs.

The next section will discuss legislation pertaining to solid waste recycling in the U.S in order to determine how it compares with the way the European Union governs solid waste.

### 2.2.2 United States' legislation on waste management and recycling

As one of the most developed economies and a populous country with over 400 million people, the US, is expected to offer another insight into how solid waste management and recycling is governed in developed economies (US Environmental Protection Agency, 2007). Legislation governing solid waste in the US is the Resource Conservation and Recovery Act (RCRA), 1976 which will be discussed in the next section.

### *2.2.2.1 Resource conservation and Recovery Act (RCRA), 1976*

According to the US Environmental Protection Agency (2007), this Act provides general guidelines for waste management programmes. The Act was passed on October 21, 1976 as a means to address the increasing growth problems that volumes of municipal waste generated. The national goals of this Act are as follows:

- To protect human health and the environment from hazards associated with solid waste disposal.
- To conserve energy and natural resources.
- To reduce the amount of solid waste generated; and
- To ensure that solid waste is managed in an environmentally sound manner.

In order to achieve these goals, one of the programmes established under the RCRA is the solid waste programme. This programme encourages States to develop comprehensive plans to manage municipal solid waste.

The RCRA mandates the Environmental Protection Agency (EPA) to develop a comprehensive set of regulations to implement the law. In addressing the challenges of resource conservation and solid waste recycling, the EPA has developed Source Separation for Material Recovery Guidelines.

According to the Electronic Code of Federal Regulations (2008), these guidelines apply to the source separation of residential and commercial waste such as separation paper, glass and cans from the waste. These guidelines require that for recycling purposes, high-grade paper and newspaper be separated from the solid waste. Procedures are recommended for recycling high-grade paper, newspaper, glass, cans and mixed paper separation. Recommended procedures in the guideline include market study, levels of separation, methods of separation and collection, storage, transportation, cost analysis, contracts and public information for solid waste recyclables.

Having established the solid waste recycling regulatory framework in the developed economies, the research will next examine some of the perspectives

of solid waste management in both developed and developing economies collectively. The study on perspectives of solid waste recycling in the developed and developing economies is done collectively in order to learn best practices from both economies that could be recommended for the City of Johannesburg. The aim is to study the background, challenges and best practices from both types of economies. The regulatory framework that governs the management of solid waste and recycling in the "City" is studied in the next chapter where the study area is also discussed in detail.

## 2.3 PERSPECTIVES ON SOLID WASTE MANAGEMENT AND RECYCLING

This section discusses general perspectives on solid waste recycling in order to understand some of the issues that could lead to the optimal recycling of solid waste (recycling of 60% of the solid waste).

### 2.3.1 Solid waste recycling

According to Tchnobanoglous *et al.* (2004:1.1-4), activities that people undertake (especially during the process of consumption of goods), usually produce solid waste material. As solid waste is considered useless, it is often discarded. Advances in technology have led to a mass production of consumer goods that are highly demanded by an increasing population with a disposable income, and this has led to an increased generation of solid waste. In the 1960s in the US, a per capita generation of about 1.2kg per person per day and by 1986, a per capita generation had increased to 1.9kg per person per day. The waste generation rate was estimated to a per capita rate of about 2.1kg per person per day in 2005.

Most of these solid waste materials that are considered waste can be reclaimed and be re-used; these materials can be considered as a resource for industrial production of goods (Tchnobanoglous *et al.*, 2004:1.1) examples are such as in the production of paper, glass, cardboard, plastic and aluminium tins.

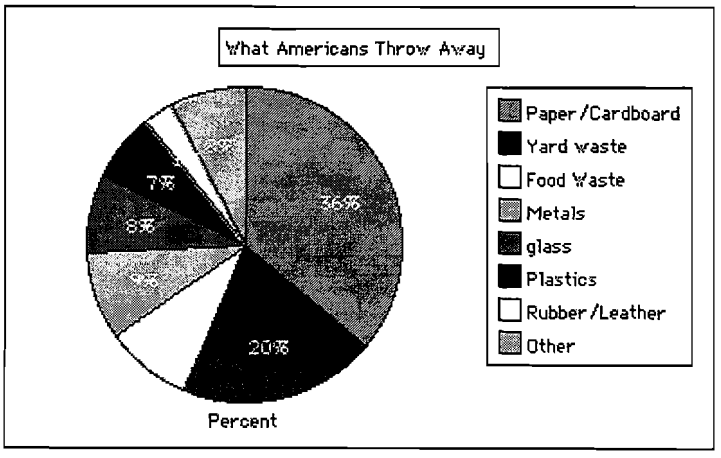
Figure 2.1 below shows the composition of solid waste from a typical American family with 2 kids. Solid waste from a typical American family is used as an

illustration because it represents solid waste composition from an urban area, and as the "City" is experiencing rapid urbanisation, this may provide a fair indication of the future trends in the solid waste composition. The next chapter (3) will discuss this fact further. For the purpose of this research, the composition of recyclable solid waste (as illustrated in Figure 2.1) is as follows according (Tchnobanoglous *et al,* 2004:1.1-4):

- Paper – 36%.
- Metals – 9%.
- Glass – 8%; and
- Plastics – 7%.

Therefore, the total composition of recyclable solid waste from an urban residential area is 60%. This represents 60% of reclaimable disposal costs that can be turned into revenue streams through recycling programmes such as establishment of buy-back centres. The composition of recyclable material within the solid waste from an industrial and commercial area is higher than 60%, according to the (Department of Environmental Affairs and Tourism, SA, 2003(a):17), this is due to large quantities of packaging waste.

**Figure 2.1** Composition of solid waste generated by households in the US.



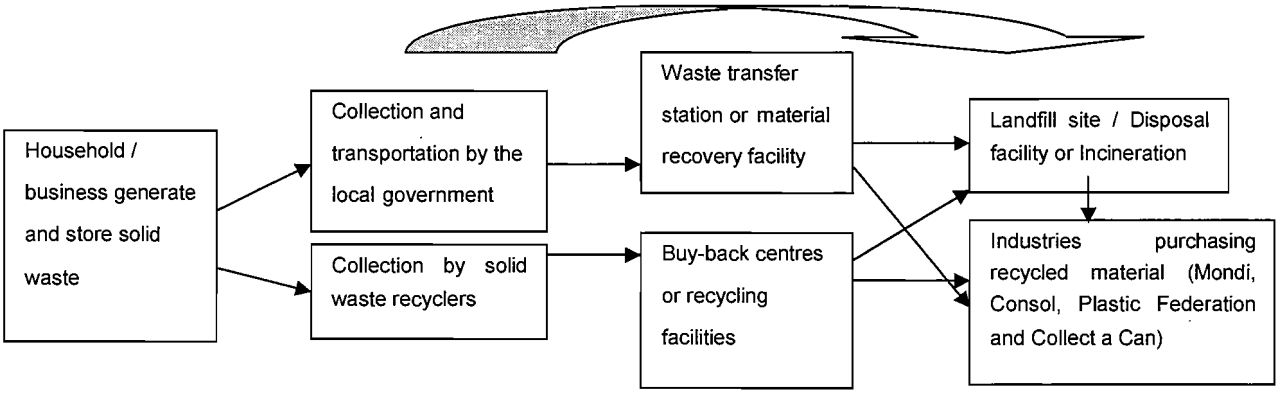

According to Proops & Page (2003:227), resource material usage per person in the world has nearly tripled between 1950 and 2000. This has led to the generation of solid waste and the depletion of virgin material such as trees, iron ore, and so on. Proops & Page (2003:82) further explain that in the process of firms producing goods for consumption and capital accumulation, the solid waste

flow may be intercepted within the economic system and transformed for input in production. This process is also known as recycling.

Figure 2.2 below depicts a typical Municipal Solid Waste Collection System in the USA (Tchnobanoglous *et al.,* 2004:1.1-2).

The flow of solid waste materials begins with businesses and households generating solid waste. These solid waste materials are either collected by solid waste recyclers (who sell them to buy-back centres), or transported by the local government to a waste transfer station before being moved to a landfill site. Industries that purchase recycled solid waste material either purchase it directly from business, buy-back centres and/or people scavenging at the landfill sites depending on the type of economies. For example, in the developed economy, industry would purchase recycled material from businesses or buy-back centres and in developing economies most of the recycled material would be purchased from the scavengers. As history points out in 2.3.2 below, solid waste has not always been viewed as a resource.

**Figure 2.2 Typical Municipal Solid Waste Collection Systems**




In the next section the history on solid waste management and recycling will be discussed.

### 2.3.2 History of solid waste management and recycling

Anderson (2004:178) states that those who salvaged garbage were looked down upon in the late nineteenth century in Europe and the U.S. Resource potential

was also not recognised by the rulers of that time. In the 1980s, the problem of the lack of landfill spaces led to the investigation and recognition of solid waste's resource potential. Since the 1990s, Germany, Belgium, Luxemburg, Netherlands and the U.S. have had less than ten years of landfill airspace capacity left, since then more landfill sites have been developed. Table 2.1 below indicates that the 63% of solid waste produced in the U.S. was landfilled as compared to 52.1% in 2005. The reduction in the solid waste going into the landfill indicate that more solid waste was recycled which led to the increased lifespan of the existing landfill sites and new landfill sites have been developed since then.

As existing landfill sites fill, urbanisation makes new sites within close proximity to urban centres less viable. This is due to the scarcity of vacant land and the high cost of land in urban areas. Consequently, the problem of landfill airspace is exacerbated. The use of landfill sites beyond urban boundaries is also not viable because of the direct and external costs of transporting the solid waste to other landfill sites beyond the urban areas (Anderson, 2004:340-341).

As the problem of solid waste management increased from the mid 1980s in developed economies, the recycling rates of solid waste also increased in the U.S. Table 2.1 below illustrates the growth in percentages of solid waste recycled in the U.S. as one of the first countries that implemented solid waste recycling. Anderson (2004:179) explains that by 1999, recycling and composting diverted 64 million tons of material from U.S. landfills and incinerators. Growth in the recycling rates of aluminium beverage cans was rapid because there was greater value attached to them, and because mining virgin ore was more difficult than recycling cans. According to (Anderson 2004, 179) in 2000, the recycling rates of aluminium cans were as follows:

- U.S. – 62%;
- Japan – 81%; and
- Western Europe – 43%.

Some benefits of recycling aluminium beverage cans is that 95% of the energy used to produce them is saved, and that aluminium mining produces three times the amount of toxic chemicals produced through electricity generation (Anderson, 2004:179).

**Table 2.2 Waste management practices in the U.S.**

| | 1960 | 1970 | 1980 | 1990 | 1995 | 2000* | 2005* |
|---|---|---|---|---|---|---|---|
| Waste generated | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Waste recycled / composted | 6.4% | 6.6% | 9.6% | 16.2% | 26% | 30% | 32% |
| Incinerated | 30.6% | 20.7% | 9.0% | 15.5% | 16.8% | 16.7% | 15.9% |
| Landfilled | 63% | 72.6% | 81.4% | 68.3% | 57.2% | 53.3% | 52.1% |

Table 2.2 above indicates that the levels of solid waste recycling (as a percentage of waste generated) have steadily risen in the U.S (Zerowasteamerica, 2006:8). This was due to the problems experienced with landfill sites airspace and management, as well as a growing awareness of the opportunities and benefits of solid waste recycling. The next section discusses some of the major factors that affect solid waste recycling.

## 2.4 FACTORS AFFECTING SOLID WASTE RECYCLING

According to Anderson (2004:179-80), research on the effects of recycling programmes and demographics on recycling rates in Massachusetts, U.S and in Southwest Sweden have determined that recycling rates increase as a result of the following factors:

### (a) Separation of recyclables from other solid waste at source (households and businesses)

The separation of recyclable waste from other solid waste at source is mainly because of high community participation. This is usually accompanied by mandatory legislation, for example the US EPA Source Separation for Material Recovery Guidelines discussed in 2.2.2(a) (United Nations Environment Programme, 2006:10). Separated recyclables at source remain unpolluted and can therefore be re-used or recycled.

The disadvantage with collection at source is that it might entail high collection costs due to the requirement of dual transportation for recyclable materials and non recyclable material. Conversely, the advantage is that the processing costs

are comparatively low (Tchnobanoglous *et al.*, 2004:8.5). Collection costs are further discussed in 2.7.2.

**(b) Increase in the per-unit disposal fees**

Increase in the per-unit disposal fees, also referred to as "*pay as you throw*", means that people pay disposal fees in proportion to waste disposed. This factor encourages residents to recycle more material so that penalty fees of disposing more solid waste material may be avoided. The collection of recyclable material is not charged in this method (Tchnobanoglous *et al.*, 2004:8.8). The increase of landfill disposal tax in the UK, as discussed earlier under section 2.2.1(a) has led to a decrease of 15% solid waste that has been disposed at the landfill. This reduction can be considered as an indirect consequence of recycling.

**(c) Higher education**

Anderson (2004:180) points out that with a higher level of education, communities become more aware of the benefits of recycling and are inclined to participate more in recycling programmes. This is one of the reasons why recycling is practiced more in developed economies than in developing economies. This fact is illustrated in developed economies such as the. U.S., Europe, and in urban areas where there is a high proportion of solid waste management problems and communities with high education levels.

**(d) Economic growth**

Tchnobanoglous *et al.*, (2004:1.1) points out that as communities' income level increases, there is demand for more goods and consequently more solid waste is generated. Anderson (2004:341) asserts that as the income levels of the communities rise, there is also more spending on education, which ultimately leads to communities being aware on the benefits of recycling. High-income levels would therefore lead to an increased generation of solid waste and increased rate of recycling.

**(e) Infrastructure**

According to the Department of Environmental Affairs and Tourism (SA, 2003:7), the availability of infrastructure (like storage facilities for the recycled material and accessible centres) where the community can sell recycled material, will increase the rate of solid waste recycling. Areas with support structures that facilitate the process of solid waste recycling (like buy-back) have increased the rate of recycling.

Christen (2002) identifies some of the key factors that affect the potential for solid waste recycling:

- the cost of the separated material;
- its purity;
- its quantity; and
- its location.

Ideally, recycled material that is clean and accessible would lead to increased rates of recycling. The costs of storage and transport are major factors that determine the economic potential for solid waste recycling. For a solid waste recycling programme to be successful, the costs of storing and transporting recycled solid waste should not be expensive when compared to the income received.

In developing economies, solid waste recycling is performed in a labour intensive way, and for very low incomes. In situations like these, the creation of employment is the main economic benefit of solid waste recycling. In developed economies, solid waste recycling is performed by the formal sector and driven by law which contain penalties that act as a deterrent. Solid waste is a general public concern for the environment and often performed at a considerable expense, for example the European Directive on Packaging and Packaging Waste, discussed in section 2.2.1(a).

Once the above factors are considered in a solid waste recycling programme, the economic viability of the solid waste buy-back centre is enhanced. The problems associated with improper solid waste disposal are discussed in the next section.

## 2.5 PROBLEMS ASSOCIATED WITH IMPROPER SOLID WASTE DISPOSAL

According to the United Nations Environment Programme (2005: 27), developed countries recycle solid waste because of high cost and scarcity of suitable sites for new landfill sites. Environmental damage caused by the solid waste material is another contributing factor. The same applies to large metropolitan areas in densely populated developing countries. Some of the problems associated with improper solid waste disposal include the following (Christen, 2002):

- Uncovered solid waste can result in conditions that are conducive to the breeding of flies and mosquitoes. These are very effective vectors that spread disease.
- Rats find shelter and food in solid waste dumps. These rats can spread diseases and damage equipment.
- The open burning of solid wastes causes air pollution. The products of combustion include dioxins, which are hazardous to the health of human beings.
- Aerosols and dusts from uncovered solid waste disposal sites can spread fungi and pathogens.
- Polluted water (leachate) flowing from solid waste dumps and disposal sites can cause serious pollution of rivers and groundwater.
- Solid waste not disposed according to engineering practice, may result in the collapse of disposal sites, and consequently may bury or kill people.
- Solid waste that is disposed in unsatisfactory ways can cause a severe aesthetic nuisance in terms of its smell and appearance.
- The decomposition of solid waste form methane-gas, which is four times more effective than carbon dioxide as a greenhouse gas, leads to climate change; and
- Solid waste disposal sites have very limited end use. Former solid waste disposal sites provide very poor foundation support for large buildings. This means that buildings constructed on former sites are prone to collapse.

The United Nations Environment Programme (2005:323) outlines the following general problem associated with solid waste disposal:

- The continuous increase in quantities of solid waste means that more virgin material is used. This may lead to the depletion of non-renewable natural resources. For example, an increased production of cans will result in an increased demand of iron-ore if little recycling of cans take place.

Implementing effective recycling programmes such as solid waste buy-back centre has benefits; these benefits will be discussed in detail in section 2.6.

## 2.6 BENEFITS OF SOLID WASTE RECYCLING

### a) A reduction in environmental pollution

According to Proops & Page (2003:82) the benefit of recycling is that it reduces waste flows that go to the environmental sink. For example, instead of glass being disposed at the landfill site, it is re-used or recycled, and this reduces the requirement for virgin natural resource input. Tchnobanoglous *et al.* (2004:1.9) maintains that recycling is the most widely accepted and practical solid waste management practice. Solid waste recycling contributes to the reduction of pollution to the environment.

### b) Conserves non-renewable natural resources

Proops & Page (2003:82) point out that recycling solid waste material saves non-renewable natural resources and stretches the lifetime of a given stock. For example, the use of recycled paper will reduce the number of trees used to make paper and this implies that the tree or forest stock will take longer to exhaust.

### c) Reduces the depletion on scarce land

According to Tchnobanoglous *et al.* (2004:1.10) recycling reduces the quantity of solid waste disposed at the landfill site, which in turn lessens the need to use scarce land for solid waste disposal or landfill sites.

### d) Creates employment

In developing economies, solid waste recycling is labour intensive. For example, the material is manually sorted, cleaned and compacted at the buy-back centre by the labourers (Christen, 2002). This generates income for the labourers, transporters and collectors of solid waste recyclables. An added benefit of solid waste recycling is that employment opportunities are created for unskilled labourers which are increasing displaced by globalisation.

**e) Business opportunities**

United Nations for Environment Programme (2005:131) state that Solid waste recycling can present business opportunities for entrepreneurs in terms of buying recyclable solid waste from the communities and in turn selling them to business as part of their raw material input. This primary goal of this research paper is to investigate the feasibility conducting such business within the City of Johannesburg

**f) Conserves energy and reduces manufacturing costs**

According to Tchnobanoglous *et al.* (2004:1.10) solid waste recycling reduces the need to use energy to mine virgin material. As a result, manufacturing cost is reduced. The saving of energy is critical because in 2008 the price of brent crude oil increased by more than 40% from the base of 2007, therefore recycling can save up to 40% of the energy costs.

**g) Reduces litter in the community**

Sanitation Connection (2002), assert that, when the community views waste as a resource, there is an extra incentive to ensure that it is collected from open spaces and stored in a safe area until it will be ultimately sold to the buy-back centre.

**h) Reduces informal salvaging at a landfill**

United Nations for Environment Programme (2005:131-132) state that when solid waste recyclables are separated at the point of generation or transfer, there will not be any recyclable solid waste at the landfill site. Therefore, there would not be any informal salvaging of recyclable solid waste at the landfill.

In order to realise the benefits of solid waste recycling, large financial investments need to be made in solid waste recycling business and programmes. The financial aspects that need to be considered to start a solid waste recycling business are discussed below.

## 2.7 FINANCIAL CONSIDERATION FOR A SOLID WASTE BUY-BACK CENTRE

According to the United Nations Environment Programme (2005:457) the four most important financial considerations for a solid waste buy-back centre are the availability of enough uncontaminated recyclable material, transport costs, market for recyclable material and capital costs.

### 2.7.1 Availability of recyclable solid waste material

In developing economies, the composition of recyclable material in solid waste is 20% to 30%. In developed countries the percentage is higher because these countries' solid waste contains a considerable amount of recyclable packaging waste. There is also a difference in the composition of solid waste between urban areas and rural areas. In urban areas the content of recyclable material within the solid waste is higher because of packaging waste. In order for the financial benefits of solid waste recycling to be realised there must be enough uncontaminated recyclable waste that can be sold at the right price (Department of Environmental Affairs and Tourism, SA, 2003(a):11). According to the Department of Environmental Affairs and Tourism (SA, 2003(a):17) a buy-back centre should ideally be located close to an industrial or commercial area where a good percentage of recyclables from packaging waste is present.

Aspects surrounding enough recyclable waste and the right price will be further discussed in Chapter 4.

### 2.7.2 Transport costs

The United Nations for Environment Programme (2005:457) explains that if the process of recycling solid waste is not properly conceived, recycling might be more expensive. The reason for this would be the double transportation for recyclables and non-recyclables solid waste. One of the best approaches of circumventing this problem is to offer incentives to the community by implementing a recyclable solid waste buy-back centre. Such a centre would purchase the recyclable waste from the community and the community will be responsible for transporting those materials to the buy-back centre. The recommended maximum distance from the community to the buy-back centre should be 5 km. The local government will save costs because of the reduced quantities of solid waste that it will transport.

### 2.7.3 The market for recyclable material

The United Nations for Environment Programme (2005:458) states that the marketing of recyclable material is fundamental to the success of any type of recycling programme. There should be agreements and contracts signed with purchasers of recyclable material prior to any recycling programme being undertaken. Local government should drive programmes to develop markets in establishing new local and cost-efficient uses for recyclable material. On a national level, government could encourage the development of markets for recyclable material from waste by offering tax breaks to industries that use recyclable material as part of their raw material input.

### 2.7.4 Capital investment and operational costs

According to the Department of Environmental Affairs and Tourism (SA, 2003(a):17) the components of a buy-back centre with the estimated capital costs are as follows:

#### *2.7.4.1 Structure*

- **Land** – this is required for positioning the buy-back centre on a site. The typical size of the smallest area is 500 $m^2$. The cost of the land depends

on the size and locality – in an urban area it would typically cost between R150 000 – R 3 million.

- **Storage** – a storage facility is necessary for storing the purchased recyclable solid waste rnaterial before it is transported to or collected by industrial recyclers. On average, the material would be stored between 2 – 7 days; and
- **Office space** – this is essential for adrninistrative tasks such as keeping records and safe keeping administrative tools.

### *2.7.4.2 Machinery*

- **Scale** – a scale is important for weighing incoming recyclable solid waste material and for reconciling the price and quantity of the material.
  In addition, a bailing machine, palletiser and crusher – are essential for compacting recyclable material and for its weighing, storing and transporting.

### *2.7.4.3 Other equipment*

- **Computer** – this is necessary for keeping records of transactions, research and communication.
- **Vehicles** – a vehicle fulfils the function of collecting recyclable solid waste material from the community, commercial and industries, and transporting it to industrial recyclers; and
- **Skips, drums and bags** – these are essential for keeping recyclable solid waste material prior transportation to industrial recyclers.

### *2.7.4.4 Personnel*

Personnel are required to manage the centre, clean offices and operate the machine/s or manually cornpact the recyclable solid waste material.

In addition to the above, initial capital is required to pay back the communities who sells the recyclable material.

Table 2.3 below summarises the component of a buy-back centre with average estimated costs. The costs below illustrate average costs and can differ between buy-back centres, depending on the locality, size and technology employed.

**Table 2.3 Components of an ideal buy-back centre and estimated capital costs**

| | | |
|---|---|---|
| **Structure** | Land | |
| | Storage | |
| | Office space | |
| | Ablutions | |
| | Total estimated costs | R950 000 |
| **Machinery** | Scale | |
| | Bailing machinery | |
| | Palletiser | |
| | Crusher | |
| | Total estimated costs | R300 000 |
| **Other equipment** | Computer | |
| | Vehicle | |
| | Skips/ drums/ bags | |
| | Total estimated costs | R170 000 |
| **Money to purchase recyclable waste from the community (float)** | Total estimated costs | R50 000 |
| **Staff** | Operator / Manager X 1 | R 3000 per month |
| | Office assistant X 1 | R 1500 per month |
| | Labourers X 5 | R 1500 per month |
| | Total estimated costs | R 12 000 per month |
| | **Grand total (estimated average costs)** | **R1 482 000** |

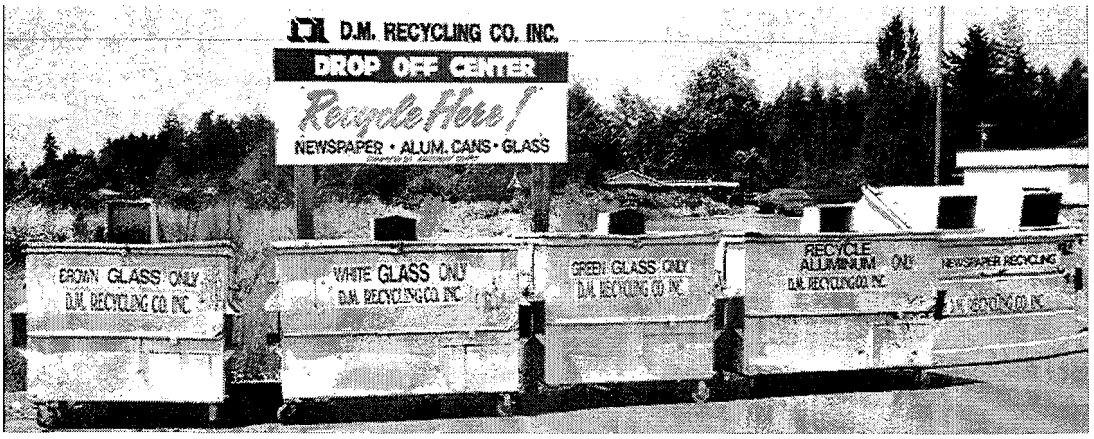
Table 2.3 above, indicates that the estimated average cost of almost R1, 5 million is needed to set up a solid waste buy-back centre. R1, 5 million is a high capital requirement especially in the developing economies.

Picture 2.1 and 2.2 respectively illustrate how mixed solid waste recyclables and sorted solid waste recyclables appear prior and after sorting.

**Picture 2.1** Mixed solid wastes prior to sorting (Tchnobanoglous *et al.,* 2004:8.9)



**Picture 2.2** Storage of sorted recyclable waste at the buy-back centre after sorting (Tchnobanoglous *et al.,* 2004:8.9).




As discussed in section 2.7.3, there must be a market in order to realise the return on investment in the buy-back centre. The next section discusses various factors that can lead to market success or failures in a solid waste recycling business.

## 2.8 MARKET EFFICIENCY TO IMPROVING SOLID WASTE RECYCLING

Anderson (2004:180) asserts that the recycling of solid waste is not necessarily market efficient but case specific. For example recycling of oil as a scarce and expensive resource would be market efficient as there will be demand of recycled oil in order to offset the cost of newly refined oil, therefore the recyclers of oil will probably be able to set a reasonable price and thus leading to market efficiency. Solid waste recycling efficiency depends on changes with societal needs and technology. In cases where there are no shortages of raw material and where recyclable material is not threatening to the environment, it would be inefficient to recycle some of the solid waste for an example if an entrepreneur wanted to recycle soil, that would not be market efficient as it is available in abundance and it is not threatening to the environment.

Approaches that could lead to market efficiency in solid waste recycling can either be:

- A free market based approach, which implies leaving recycling in the hands of the public to manage; and / or
- A government intervention that would coerce the public to recycle through using regulatory means (Anderson, 2004:180).

As discussed in section 2.2.1 (a), the introduction of the packaging waste regulation in the UK has made it mandatory for processors of packaging waste to recycle. This has led to solid waste recycling rates increasing from around 35% in the early 1990s to 60% in 2008.

Anderson (2004:180) further explains that market failure in a free market based approach of recycling solid waste is the result of the following two factors for example the US before the late 1960s:

- **Externalities**

  Externalities refer to external benefits such as environmental benefits of recycling (for example trees preserved, pollution avoided, and energy saved and landfill air space saved) might be ignored when the **private market**

determine the market price of recyclables. These market prices would normally not provide enough incentive for solid waste recycling, hence a market failure in recycling.

- **Imperfect information**

Consumer knowledge is a strong predictor of recycling. When **market participants** are unaware of the environmental benefits of recycling for themselves and the society, it may lead to the recycling market being inefficient. The environmental benefits that the market fails to recognise could mean long-term financial benefits to the society, such as a reduction in disposal costs of solid waste.

In relation to the discussion on the market challenges that enhance or lead to inefficient level of solid waste recycling, there are economic instruments that can be explored in order to enhance solid waste recycling. In the next section, economic instruments that enhance solid waste recycling will be discussed.

## 2.9 ECONOMIC INSTRUMENTS TO ENHANCE SOLID WASTE RECYCLING

The United Nations for Environment Programme (2005:443-445) asserts that the following economic instruments can enhance solid waste recycling. These economic instruments have led to some degree of success in the recycling programmes of developed economies.

### 2.9.1 User charges to households

This refers to charges that are levied to defray costs associated with the collection and treatment of solid waste. These charges need to be structured in such a way to act as an incentive to separate recyclable solid waste from the other waste stream. The utility of this approach can be measured by the extent to which solid waste has been reduced as a result of implementation of a variable disposal fee based on the quantity of waste collected or pay per bin system. For example, the higher the quantity of waste collected the higher the collection costs. This will serve as an incentive for households to recycle or separate

recyclable waste from non-recyclable. Cost savings may be realised as a result of the reduced waste that would be collected.

### 2.9.2 Disposal charges

This is also referred to as the "tipping fee". These are costs charged when disposing of solid waste at a landfill site. This serves as a deterrent for people not to dispose a large quantity of solid waste at a landfill site. It is therefore an incentive for households to dispose less waste. This economic instrument should be used in conjunction with stringent law enforcement, as it may lead to unintended illegal dumping.

### 2.9.3 Deposit systems

The utility of the deposit strategy as a regulatory device is practiced worldwide and its strategy is performed in two steps:

- Step 1 refers to the imposition of special charges on certain consumer items like 1.25 litre cold drink bottles; and
- Step 2 refers to the recovery of the special charges by the purchaser or consumer when a bottle is returned for recycling. In this system, there is a success rate of 80% (and greater) of materials returned for recycling.

The monetary incentives are considered sufficient to induce the desired compliance with regard to recycling and it is more successful than the voluntary systems.

### 2.9.4 Subsidies

Subsidies are largely used in economies such as the U.S., Denmark, Japan, Poland and Finland and can be used to subsidise the development of solid waste recycling facilities. The market for recycled materials can be stabilised through implementing the following instruments:

- The guarantee of an income from a solid waste recycling facility. This could be either through setting minimum prices for recyclable solid waste, or through setting the quantity of incoming material above a defined acceptable threshold.

- The institution of investment grants by government and non-governmental organisation, accelerated depreciation, and soft loans designed to encourage private enterprise to implement solid waste recycling programmes; and
- Incentives in the form of tax credits to industries that use recycled material as part of input material.

To address the identified shortcomings for solid waste recycling of at least 60%, it is imperative that government interventions support an approach based on the free market.

## 2.10 CONCLUSION

The study in this chapter indicates that urbanisation and an increase in the standard of living in the 1980s have resulted in an increase of the quantity of solid waste generated by households and businesses. For example, the typical American family in the 1960s generated solid waste of a per capita rate of about 1, 2 kg per person per day. In 2005, it was estimated at a per capita rate of 2, 1 kg per person per day. The increased quantity of solid waste presented problems such as the non-availability of land for disposal, environmental problems and health problems.

The study indicates that on average, 60% and higher of generated solid waste can be recovered and re-used for the industrial production of goods. The opportunities for reusing recyclable solid waste material were not fully exploited by industries and the communities, prior to the introduction of the Packaging Waste Directive within the European Union and the Source Separation Material Recovery Guideline in the U.S. in the early 1990s. This statement is supported by the fact that, prior to the 1990, the recycling rates in the U.S. stood at less than 10%. In the 1990s, and increased to more than 60%. The recycling programmes in developing economies are mostly motivated by the opportunities of deriving income, as it is labour intensive.

The benefit of recovering and recycling solid waste is that it addresses certain social, environmental and job creation problems. There are also opportunities of turning solid waste recycling into a business (such as the establishment of solid

waste buy-back centres) that can generate income for communities and entrepreneurs. The success of a solid waste recycling business depends on many factors, such as: legislation that would require communities and businesses to recycle, quality and quantity of the recyclable solid waste material available, infrastructure that support recycling initiatives, participation of communities and business in recycling, and economic benefits.

Factors that affect the potential of deriving economic benefits from a solid waste buy-back centre business are as follows: the capital investment costs, operational costs, efficiency of the market, and presence of the economic certain instruments that support recycling.

From the analysis of the above, it can be concluded that in general solid waste buy-back centre business adds value to communities and is a viable business, especially in urban areas where there is considerable packaging waste. The success of a solid waste buy-back centre business will rely on structural support such as legislation, community participation, the availability of funds for capital investments.

Chapter 3 will focus on the status quo with regard to solid waste recycling within South Africa with a focus on the City of Johannesburg. Factors that enhance or prohibit optimal recycling rates will also be discussed.

# CHAPTER 3: SOLID WASTE MANAGEMENT AND RECYCLING IN SOUTH AFRICA AND THE CITY OF JOHANNESBURG

## 3.1 INTRODUCTION

In Chapter 2 the international legislation on solid waste recycling, history on solid waste recycling and international best practices on solid waste recycling were discussed. In Chapter 3 the research will narrow the focus from an international perspective to the South African situation especially the City of Johannesburg. Chapter 3 will discuss legislation and policies that affect solid waste management and recycling in South Africa. The aim is to understand the legislative context from which solid waste recycling is undertaken especially with regard to the establishment and operation of solid waste buy-back centres.

This chapter will discuss in detail each solid waste recyclable item (paper, glass, cans and plastic) in order to determine the challenges and success with regard to each solid waste recyclable material under study. The discussion on each solid waste recyclable item will provide more insight on the trends with regard to the increase or decrease in the solid waste recyclable items.

In particular, this chapter will discuss the legislation, policies, plans and programmes regarding solid waste management in the City of Johannesburg. Challenges are being faced in terms of the availability of land for disposing of waste and promoting recycling. The aim is to better understand the challenges and the successes faced by the City of Johannesburg. The study of these strategies, plans and projects will identify the shortcomings that need to be addressed in order to optimise the levels of solid waste recycling and thus making the establishment of a solid waste buy-back centre a viable business. The next section discusses legislation and policies affecting solid waste management and recycling in South Africa.

## 3.2 LEGISLATION AND POLICIES AFFECTING SOLID WASTE MANAGEMENT AND RECYCLING IN SOUTH AFRICA

Once properly designed, correctly implemented and properly enforced, legislation can play a critical role in changing peoples' behaviour. For this reason the legislative framework governing solid waste management and recycling in South Africa will be discussed in this chapter. The next section will discuss the Constitution of the Republic of South Africa which is a broad framework for ethical management of the environment.

### 3.2.1 Constitution of the Republic Of South Africa No. 108 Of 1996

Section 8 of the Constitution (1996) states that the Constitution of the Republic of South Africa (No.108 of 1996) provides a broad framework to direct the spirit of all legislation in South Africa. Included in this legislation is also the environmental legislation. Section 24 of the Constitution (1996) that addresses environmental rights in the Constitution (1996) states: "Everyone has the right to:

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

The Constitution therefore requires that the generation, handling, treatment and disposal of solid waste management do not infringe on the rights of the people. In this regard, the recycling of solid waste offers a solution for addressing the challenge of managing solid waste.

To address the challenge of solid waste management and recycling, the National Waste Management Strategy and Action Plans were developed in 1999. This legislation is discussed in the next section.

### 3.2.2 The National Waste Management Strategy (NWMS) and Action Plans Of 1999

According to the Department of Environmental Affairs and Tourism (DEAT) (1999:7) the strategy was conceived in 1999 with the main purpose of effecting Section 24 of the Constitution (1996), which states that everybody has a right to an environment which is not harmful or detrimental to their well being. The strategy is a long term plan until 2010 and its main objective is to provide holistic and integrated waste management along the value chain of waste management (from generation to disposal).

The strategy covers a wide range of waste initiatives, such as waste minimisation, waste information system, hazardous waste management. The responsibility of the Department of Environmental Affairs and Tourism (DEAT) would be to co-ordinate solid waste recycling by investigating the best methods for promoting and implementing solid waste recycling. The DEAT would moreover explore private and public partnerships by soliciting proposals from the private sector.

According to the Department of Environmental Affairs and Tourism (1999: 10-12), the strategy includes two broad frameworks for the type of funding mechanisms to be adopted for waste management. These frameworks are:

- Financial pricing mechanisms, based on a cost-recovery approach.
- Economic approaches, which introduce economic instruments such as waste disposal costs into the pricing structure of integrated waste management in order to achieve specific waste management objectives.

These broad frameworks for funding mechanisms would be implemented through the means set out below. The implementation of the "Polluter-Pays-Principle" by all three tiers of government (national, provincial and local) is an integral component of both approaches, which implies that anybody who causes pollution will pay for prevention, removal or management of that pollution instead of government paying for that pollution.

- The funding intended for this strategy would be generated from a variety of sources, depending on the allocation of responsibility for waste management. In the case of national and provincial government, departmental budgets would be used and supplemented (where appropriate) by donor funding such as from the Danish government for specific initiatives. The national government managed to secure donations from the Danish and Norwegian government to develop the guidelines for solid waste recycling and the piloting of the National Waste Information System (WIS). In the case of local government, funding would be generated by introducing appropriate cost recovery mechanisms for services delivered. The potential for utilising the Municipal Infrastructure Investment Fund to assist with the establishment of facilities would also be investigated.
- The Department of Environmental Affairs and Tourism confirmed the development of a national pricing strategy to assist local government with the introduction of appropriate user charges that would be legislated as part of the law reform process and be completed by 2000. The development of this strategy would be undertaken in consultation with the Department of Trade and Industry, and the Department of Finance. The national pricing strategy has not been developed thus far and the reason thereof could not be established.
- The Department of Environmental Affairs and Tourism would investigate the use of economic instruments to promote the expansion and adoption of waste minimisation and recycling initiatives; and
- The "Polluter-Pays-Principle", which is a principle of the National Environmental Management Act (Act No. 107 of 1998), would be implemented for the most part through regulations. Possibilities to supplement this income with dedicated economic incentives would be investigated by the Department of Environmental Affairs and Tourism, in conjunction with stakeholders.

In terms of the solid waste recycling, the short term priorities of the strategy up to 2002 were as follows (Department of Environmental Affairs and Tourism, 1999:18-20):

- The promotion of waste recycling, which would be incorporated in pollution and waste legislation. This was to be drafted during 1999, however the promotion of waste recycling in waste legislation started with the National Waste Bill of 2006 that still needs to be promulgated. The National Waste Bill of 2006 is discussed under section 3.1.4; and
- The Department of Environmental Affairs and Tourism observed that a number of recycling initiatives such as the Itsoseng solid waste buy-back centre have been initiated by the private sector. The Department of Environmental Affairs and Tourism would identify the current recycling initiatives and consult with the responsible bodies in order to ascertain the most appropriate approach to conduct research and development projects. It was envisaged that this process would run from 1999 to 2003.

The Department of Environmental Affairs and Tourism (1999:42-43) sets out the medium and long term goals of the strategy (from 2002 to 2010) as follows:

- To publicise support for waste recycling.
- To make recycling in South Africa more economically viable.
- To encourage the private sector to undertake recycling initiatives; and
- To conduct an investigation which will examine the feasibility of a range of recycling projects, with the emphasis on projects that are already operating successfully.

Some of the initiatives relevant to solid waste recycling that the strategy intended to implement include the following:

- A feasibility study of potential sectors/generators of recyclable solid waste materials, methods of recycling, and appropriate legislation, namely a refundable deposit system; and
- Investigation of economic and regulatory incentives to promote recycling.

A search on the DEAT's website for documents relating to these initiatives revealed that only the feasibility study on the potential generators of recyclable solid waste material and methods of recycling had been undertaken, and culminated in the document titled "Guidelines on solid waste recycling".

The following initiatives were planned to be implemented through the following programmes but have not been implemented, as evidenced when searching under programmes on DEAT's website. The reason thereof could not be established:

- The promotion of separating recyclable material from non-recyclable material at source (households or business premises).
- The commitment of government to promote the viability of solid waste recycling through carefully researched legislation.
- The provision of economic and regulatory incentives that would promote recycling by 2002.
- Effecting an investigation that would identify sectors or generators that generate abundant, marketable recyclable materials and researching and developing appropriate methods of recycling (source separation, composting and tyre recycling). The information generated from this investigation would be used to set waste-recycling targets in the future. This investigation was scheduled to run from 1999 to 2002 and to date has not happened.
- Recognising that the success of the recycling initiatives of the strategy was dependent on compliance by all associated with waste, as well as appropriate enforcement of regulations. In this regard, institutional measures to ensure compliance and the success of these initiatives would still need to be further investigated; and
- The use of targets in the implementation and further development of resource recovery and recycling strategies would be further investigated.

According to the Department of Environmental Affairs and Tourism (1999:71), the institutional arrangement for implementing the strategy is for national government to develop legislation and policies with regard to solid waste recycling. Provincial government would be responsible for capacitating local government, which would in turn primarily be responsible for implementing these initiatives and to provide transport for the collection and delivery of facilities. Where possible, communities will be encouraged to take up these initiatives with local government playing a facilitation role.

### *3.2.2.1 Legal and financial implications of the national waste management strategy*

According to the Department of Environmental Affairs and Tourism (1999:72), solid waste recycling has huge financial implications because of the infrastructure and systems that need to be established in order to operate the solid waste buy-back centre at a profit. Moreover, some of the activities required might be questionable, (for example legislating source separation of recyclable material from waste). The financial and legal challenges of the national waste management strategy would however be identified by conducting a feasibility study. Based on the results of the investigation into recycling initiatives such as the establishment of solid waste buy-back centres, legislation and regulations to promote recycling was intended to be promulgated by 2002. The studies and legislation promoting recycling have not been undertaken to date.

Economic incentives such as rebates dedicated to waste management were to have been investigated by national government. National government could demonstrate its commitment to recycling by providing seed funding and by setting clearly defined incentives. The development of any economic instruments would be undertaken in consultation with the Departments of Trade and Industry and the Department of Finance, as well as with full stakeholder participation.

The economic value of recycling stems from the fact that treatment and disposal costs are eliminated through recycling. The next section will discuss the National Environmental Management Act.

### 3.2.3 The National Environmental Management Act (Act No 107) Of 1998

Section 2 of the National Environmental Management Act, Act No. 107 of 1998, spells it out that this Act (NEMA) offers overarching legislation that provides a framework to all legislation pertaining to the environment (including solid waste management and recycling).

The pre-amble of the NEMA (1998) assert that:

"Everyone has the right to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that:

- prevent pollution and ecological degradation;
- promote conservation; and
- secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".

The improvement and management of the environment is a functional area of concurrent national and provincial legislative competence, and all spheres of government and all organs of state must co-operate with, consult and support one another in the protection of the environment. Solid waste buy-back centres as a big component of recycling play a huge role in protecting the environment as discussed in chapter 2 under section 2.6.

Section 2 of NEMA spells out principles for decision-making in terms of the environment. Some of the principles relevant to solid waste management and recycling are as follows:

- Development must be socially, environmentally and economically sustainable.
- Waste should be avoided (where it cannot be altogether avoided, it should be minimised and re-used or recycled where possible, or otherwise disposed of in a responsible manner).
- The use and exploitation of non-renewable natural resources should be responsible and equitable, and take into account the consequences of the depletion of the resource; and
- The development, use and exploitation of renewable resources and the ecosystems of which they form part, should not exceed the level beyond which their integrity is jeopardised.

The National Environmental Management Act (107 of 1998) provides a framework for the National Environmental Management: Waste Management Bill, which is discussed in the following section.

### 3.2.4 National Environmental Management: The Waste Management Bill (2006)

According to the Department of Environmental Affairs and Tourism (2006:13-14), the main purpose of the (National Environmental Management) Waste Management Bill of 2006 in terms of solid waste recycling is to protect the health and well-being of the public, and the environment by providing reasonable measures for:

- The minimisation of the consumption of natural resources.
- The avoidance and minimisation of the generation of waste; and
- The recovery, re-use and recycling of waste.

In terms of the Waste Management Bill of 2006, government (through all its three tiers of government responsible for implementing this bill) is obliged to reduce the amount of waste generated. Where waste is generated, the state has to ensure that waste is recycled, re-used or recovered in an environmentally sound manner before being safely treated and disposed of (Department of Environmental Affairs and Tourism, 2006:14).

According to the Department of Environmental Affairs and Tourism (2006:15), the minister of environmental affairs and tourism was compelled to develop a strategy for waste reduction and waste recycling within 2 years of the enactment of this bill. The bill also requires the minister to develop national standards for waste recovery, re-use and recycling. The bill essentially allows the provincial and local government to develop standards, requirements and financial arrangement for solid waste recycling. To date the bill has not been enacted due to delays in parliament passing the bill; therefore programmes under the bill have also not been implemented.

In terms of issues pertaining to solid waste recycling, the Department of Environmental Affairs and Tourism (2006:29-30) states the following:

a) The net results of any solid waste recovery re-use or recycling activity undertaken by any person must use less natural resource and be less harmful to the environment than disposal.

b) The Minister can make regulations that require any person to recover, re-use or recycle the product or percentage thereof that the person has manufactured or imported; and
c) Local government can require any person making use of the municipal collection service to separate specified types of waste from the general waste for the purposes of recovery, re-use or recycling.

In September 2001 the Polokwane declaration on Waste Management was signed by representatives of government at national, provincial, and local level, and civil society. This declaration sets targets for waste recycling and is discussed in detail in the next section.

### 3.2.5 The 2001 Polokwane Declaration on Waste Management

The Department of Environmental Affairs and Tourism (2001:1) reports that in September 2001 in Polokwane, government, civil society and the business community declared to reduce waste generation and disposal by 50% and 25% respectively by 2012. Government, civil society and the business community also declared that a plan for zero waste would be developed by 2022, by implementing a number of actions. The actions in no particular that were to be implemented to achieve the above targets are as follows (Department of Environmental Affairs and Tourism, 2001:1-3):

- Implementing the National Waste Management Strategy of the Department of Environmental Affairs and Tourism that was discussed under section 3.1.2.
- Developing and implementing a Legislative and Regulatory Framework to promote waste avoidance, prevention, reduction, re-use and recycling.
- Establishing and enforcing targets for waste reduction and recycling;
- Setting benchmarks towards achieving the 2012 target.
- Disseminating information on the status and trends on waste reduction in the country.
- Exploring the use of economic instruments to support waste management initiatives.
- Establishing systems to ensure that physical and financial responsibility for waste is borne by the producers of the products.

- Effectively managing waste disposal/reprocessing facilities and thereby avoiding the need to establish new, or expand existing facilities; and
- Promoting employment and economic empowerment opportunities, in particular in small, medium and micro enterprises, through increased product re-use and material recycling.

In providing assistance to local government to achieve the targets of the Polokwane Declaration on Waste Management, the Guidelines on Solid Waste Recycling were developed in 2003 by the Department of Environmental Affairs and Tourism. These guidelines are discussed in detail in the following section.

### 3.2.6 The Guidelines on Solid Waste Recycling

According to the Department of Environmental Affairs and Tourism (2003:1-5), the Guidelines on Solid Waste Recycling are to assist local government to implement solid waste recycling in terms of the National Waste Management Strategy. The Guidelines on Solid Waste Recycling includes some of the following guides:

- The hierarchy of dealing with solid waste, for example waste avoidance, waste minimisation, waste re-use, waste recycling, waste treatment and ultimately waste disposal.
- Education on what recycling is and why solid waste should be recycled.
- Determining what can be recycled and the benefits of recycling.
- Legislation to address solid waste recycling.
- Economic incentives for recycling solid waste.
- How to establish a solid waste buy-back centre.
- Solid waste recycling by local government.
- Conducting a cost benefit analysis for solid waste recycling; and
- Determining a market and conducting a market study for solid waste recycling.

The Guidelines on Solid Waste Recycling provide a blueprint for education on solid waste recycling and for establishing a solid waste recycling programme that includes the establishment of solid waste buy-back centres (Department of Environmental Affairs and Tourism, 2003:8). The legislative framework

governing solid waste recycling has been discussed; each recyclable item under study will be discussed to determine how the solid waste recycling of each has progressed.

## 3.3 THE STATE OF SOLID WASTE RECYCLING IN SOUTH AFRICA

Section 3.2 will analyse the status quo in South Africa of the main individual solid waste items under study. The first solid waste item to be studied is paper recycling.

### 3.3.1 Paper Recycling

According to the Paper Recycling Association of South Africa (2008), the state of paper production, consumption and recycling in 2007 was as follows:

**Table 3.1 Paper Production and Consumption in South Africa for 2007 (all values in metric tons):**

| | Paper Production | Paper Imports | Paper Exports | Paper Consumption |
|---|---|---|---|---|
| Newsprint | 349 296 | 1 766 | 23 244 | 327 818 |
| Printing/Writing | 782 681 | 351 631 | 426 412 | 707 900 |
| Corrugated Materials/ Containerboard | 1 182 473 | 21 723 | 328 651 | 875 545 |
| Other Wrapping Papers | 87 212 | 74 295 | 15 828 | 145 679 |
| Tissue | 194 550 | 5 101 | 2 188 | 197 464 |
| Other Paper | 34 786 | 54 162 | 8 385 | 80 563 |
| Board | 95 583 | 40 795 | 1 215 | 135 163 |
| **Total** | **2 726 582** | **549 473** | **805 922** | **2 470 132** |

Table 3.1 above indicates that South Africa produces 2 726 582 metric tons of paper. When compared with the quantity of paper consumed, it can be deduced that South Africa is a net exporter of paper (256 450 metric tons). As a net

exporter of paper, South Africa can thus play a very influential role in the market for recycled paper. Table 3.2 below indicates how recycled paper is produced and consumed:

**Table 3.2 Recovery of Recyclable Paper in 2007** (values in metric tons):

| | **Paper recovered in South Africa** | **Recovered paper exports** | **Recovered paper exports[1]** | **Consumption of recovered paper in SA** |
|---|---|---|---|---|
| Newspapers | 117 335 | 2 685 | 14 098 | 105 922 |
| Magazines | 44 617 | | 4 000 | 40 617 |
| Corrugated, solid cases, kraft papers | 557 017 | 177 | 44 489 | 512 705 |
| Office, graphic papers | 170 632 | | 2 500 | 168 132 |
| Mixed and other papers | 140 832 | 401 | 22 232 | 119 001 |
| **Total** | **1 030 434** | **3 262** | **87 319** | **946 377** |

| **Recoverable paper** | |
|---|---|
| Paper consumption | 2 470 132 |
| Less paper exported in agric products[2] | 183 549 |
| Less paper unsuitable for recovery[3] | 395 221 |
| Recoverable paper | 1 891 362 |

| **Recycling rates** | |
|---|---|
| Recyclable paper recovered as % of paper consumption | 41.7% |
| Recovered paper used in paper produced in SA | 34.7% |
| Recovered paper as % of recoverable paper | 54.5% |

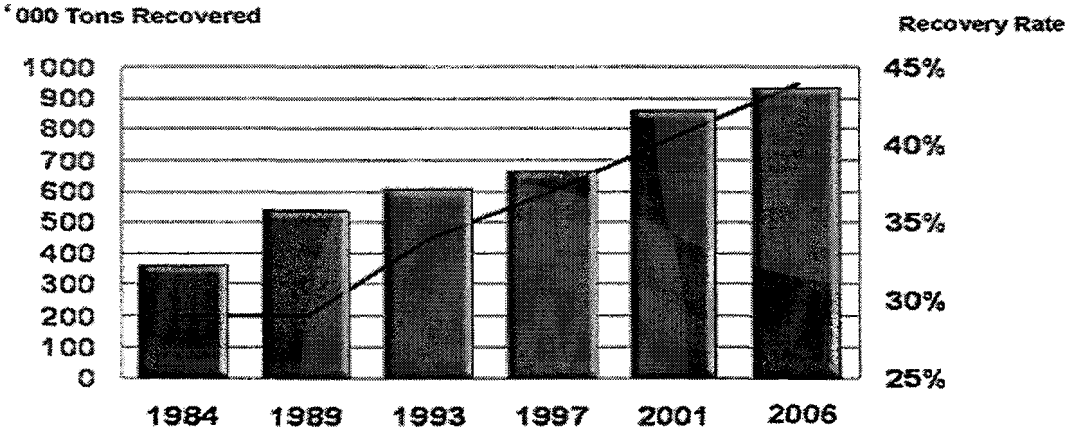
From Table 3.2 above it is evident that only 41.7% recyclable paper is recovered as a percentage of paper consumption in South Africa. Ideally, the recycling rates can be increased to over 50% (SOER, 2003:70). The percentage of recovered paper as a

percentage of recoverable paper is 54.5%. This simply means that around 860 928 metric tons of paper is dumped at the landfill where it takes up a lot of landfill airspace. The total recoverable paper in South Africa is 1 891 362 tons. (Paper Recycling Association of South Africa, 2008).

Figure 3.1 below indicates that the recovery rates of paper for recycling have been steadily rising over the years (from about 32% in 1984 to 44% in 2006). This factor can be attributed to problems with landfill airspace and to a growing environmental awareness on the benefits of recycling (Paper Recycling Association of South Africa, 2008).

**Figure 3.1 Trends in the recovery rate of paper**

South African Paper Recycling (Tons and Rate)




2005 Recovery Rate = $\frac{\text{Recovered}}{\text{Paper Consumption}} = \frac{935}{2144} = 44\%$

The next item that is going to be discussed in the next section is the recycling of plastic in South Africa.

### 3.3.2 Plastic Recycling

Plastic Federation of South Africa (2008) provides the following figures for plastic (herewith referred to as polymers 2007 / 2008) that is consumed, recycled, produced, imported and exported:

- Local polymer consumption (virgin and semi-finished) 1 320 000 tons.
- Local recycled material consumption 150 000 tons.
- Local polymer production 1 000 000 tons.
- Polymer imports 365 000 tons.
- Polymer exports 265 000 tons; and
- 150 000 tons of recycled polymer consumed.

The figures above indicate that the total percentage of recycled polymer consumed as a percentage of local polymer produced is approximately 8% and there are not benchmarking norms available for South Africa.

According to Plastic Federation of South Africa (2008), littered plastics bags have drawn a lot of attention. As a result, legislation was introduced in 2003 with the aim of reducing the amount of litter and encouraging the re-use of plastics and recycling plastics. This legislation refers to the Regulations on the Compulsory Specification on plastic bags, published in Government Gazette notice 24839, No. R625 (9 May 2003). The Regulations stipulate the *minimum* thickness of plastic bags as follows:

- For use in South Africa, the manufacture, trade and commercial distribution of plastic bags with a wall thickness of less than 80 micrometres is prohibited. However, plastic bags of between 30 and 80 micrometres may be manufactured, traded and commercially distributed for use in South Africa, provided that such bags do not have any printing, painting or marks of any kind, not expressly required by law; and
- The maximum tolerance that will be allowed on the thickness of 30 micron is 20% for a period of five years, after which an appropriate standard to achieve 30 micron will be developed.

The purpose of promoting plastics with a thickness of more than 30 micron is to ensure that the plastic can be re-used or recycled. Plastic Federation of South Africa (2008) asserts that an excise duty of 3c per bag was imposed on 1 June 2004. This money is collected by SARS from all registered bag manufacturers and importers. The money collected from the plastic levy is used to develop and promote new plastic recycling facilities. All plastic bag manufacturers and importers of bags must be registered with SARS, Buyisa-e-Bag and the SABS

(Plastic Federation of South Africa, 2008) so that they can be monitored. The next item to be discussed in the next section is the can recycling in South Africa.

### 3.3.3 Can Recycling

According to Collect-a-can (2008), the recovery of cans was 18% of the output of cans before year 1993. In 1993 it was 25% (when Collect-a-can was re-launched). In 1997 the recovery of cans was more than 50% and currently (2008) it is 67.5% (in line with trends in the developed economies).

Collect-a-Can (2008) provides assistance to upcoming entrepreneurs through advice on how to increase productivity and profitability. Additional assistance is in the form of bags for collection, arrangement of transport, and the use of mobile balers. The support provided by Collect-a-can has contributed to increasing the recovery rates of cans. Collect-a-can's assistance indicates that entrepreneurs have to set up buy-back centres in order to change human behaviour in the solid waste recycling business. Incentives need to be used as an instrument, and in this regard, Collect-a-can has been successful.

### 3.3.4 Glass Recycling

The Glass Recycling Company (2008) explains that the Glass Recycling Company is South Africa's national organisation responsible for facilitating the recovery of waste glass for recycling. A Memorandum of Understanding (MOU) was signed on May 19, 2005, which marked the establishment of The Glass Recycling Company. The mandate of this company is to facilitate the increase in glass recycling in South Africa. Operations by The Glass Recycling Company commenced in July 2006.

The Glass Recycling Company (2008) asserts that in 2007, the organisation increased the recovery of glass from 148 000 tons to more than 183 000 tons. This represents an almost 25% growth in recovery on the previous year's (2006) figures. This year (2008) the company expects to increase glass recovery in excess of 200 000 tons.

The Glass Recycling Company, which in essence is a joint industry initiative, has partnered stakeholders such as National Government, glass manufacturers, fillers (users of glass to package products), and recyclers in its efforts to

substantially increase the current recycling rate (Glass Recycling Company, 2008).

The Glass Recycling Company (2008) state that the company has a mandate to set up new entrepreneurs throughout South Africa, who would pay for any waste glass that is brought for recycling. Up to 60 collectors sell glass to an entrepreneur. The Glass Recycling Company (2008) further intends to set up at least 80 entrepreneurs per annum, which in turn will see at least 4 800 new informal jobs created annually. There are at least 200 existing entrepreneurs throughout the country who have already created in the region of 12 000 informal jobs through the collection of waste glass.

The largest percentages of the entrepreneurs that recycle glass are located in Gauteng. This bias is linked to the volumes of glass generated in this region. According to the Glass Recycling Company (2008), there is currently a lack of awareness among potential collectors of the monetary value of waste glass. The Glass Recycling Company (2008) also states that in 2007 the company began placing glass banks at strategic locations throughout the country to facilitate the recovery of waste glass from urban consumers and city dwellers. To date, 550 banks have been installed at 339 different sites. More banks will be placed between the year 2008 and 2010. The role players in the glass industry are shareholders in the Glass Recycling Company.

In South Africa, glass accounts for 4.7% of the country's total waste. Currently, only 183 000 tons or 26% of all glass containers produced annually are retrieved for recycling. According to the Glass Recycling Company (2008), about 550 000 tons of waste glass finds its way into landfills in South Africa. The next section discusses the state of solid waste recycling within the City of Johannesburg.

## 3.4 SOLID WASTE RECYCLING WITHIN THE CITY OF JOHANNESBURG

In section 3.1 national legislation affecting solid waste recycling was discussed and in section 3.3. legislation, policies, plans and programmes with regard to solid waste recycling will be discussed within the City of Johannesburg will be discussed. In the next section, the City of Johannesburg Waste Management by-laws are discussed.

### 3.4.1 City of Johannesburg Waste Management By-Laws 2003

The by-laws are a legislative tool that local government can use to enforce compliance with the laws within local government. The by-laws must be within the framework of national legislation. The by-laws must not contradict national legislation and must also be not less strict than national legislation. According to Section 2 of the City of Johannesburg Waste Management by-laws (2003(a)), the underlying principle of the City of Johannesburg Waste Management by-laws is to establish a waste management hierarchy in the following order of priority:

- avoidance, waste minimisation and waste reduction;
- re-use;
- recycling, reprocessing and treatment; and
- disposal.

This waste hierarchy of managing waste is in line with the National Waste Management Strategy and Action Plan as discussed in section 3.1.2. Solid waste recycling has been prioritised over disposal because of problems encountered with availability of land for disposal, economic benefits and the environmental benefits discussed in section 2.5 and 2.6.

Section 3 of the City of Johannesburg Waste Management by-laws (2003(a)) states that the main objective of these by-laws is to regulate the collection, disposal, treatment and recycling of waste. In terms of Section 3 the following needs to be done to achieve the objectives of these by-laws:

- minimise the consumption of natural resources;
- promote the re-use and recycling of waste; and
- encourage waste separation to facilitate re-use and recycling.

In terms of recyclable waste, Section 13 and 14 of the City of Johannesburg Waste Management by-laws (2003(a)) assert that the storage and collection of recyclable waste should not cause a health nuisance.

People transporting recyclable waste should obtain a license to transport recyclable waste. This is in accordance to Section 24 of the City of Johannesburg Waste Management by-laws (2003(a)).

In terms of solid waste recycling, the by-laws do not state any other requirement. The next section will discuss the waste policy for the City of Johannesburg.

### 3.4.2 Waste Management Policy for the City of Johannesburg

The waste management policy provides a framework from solid waste management including recycling will be managed. In the next section the objectives of the waste management policy for the City of Johannesburg are discussed.

#### *3.4.2.1 Objectives of the Waste Management Policy*

According to the City of Johannesburg (2003(b):2), the objectives of the waste management policy in terms of solid waste recycling are as follows:

a) To promote conservation of natural resources; and

b) To promote strategic waste interventions, which promote waste avoidance, minimisation, recycling and re-use (waste hierarchy), so that the waste targets will be aligned with that of the Polokwane Declaration over a given period.

#### *3.4.2.2 Principles Guiding Solid Waste Recycling in the City of Johannesburg*

According to the City of Johannesburg (2003(b): 5), the principles guiding solid waste recycling are as follows:

a) Waste hierarchy - in promoting and achieving *waste minimisation* (cleaner production); *recycling* (re-use, recovery and composting); *treatment* (physical, thermal and chemical destruction); and *disposal* (and filling); and

b) Separation at source: Organised waste separation at source shall be encouraged, thus improving the rate of recycling and similarly reducing the volumes of waste to landfill.

### *3.4.2.3 Specific Waste Targets of the Policy:*

As stated by City of Johannesburg (2003(b): 7-8), the specific waste targets mentioned in the policy are as follows:

a) Achieve 40% of the targets listed in the Polokwane Declaration, which commits to a 50% reduction in waste generation and 25% reduction in disposal by 2012, while developing a zero waste plan by the year 2022.

b) Achieve the following targets in respect of the waste hierarchy (avoidance, minimisation, recycling and re-use) by the year 2015 commencing in the 2004 – 2007 financial cycle:

- Divert up to 40% of all household paper, plastic, cans and glass for purposes of recycling. This will be implemented in two phases: a 10% reduction for the period 2004 and 2005, and an additional 20% for the period 2006 and 2007. Data on progress to date could not be obtained as there are no systems in place to monitor quantities of solid waste recycled within the City of Johannesburg.

- Increase capital expenditure in the 2006/2007 financial cycles to establish new waste transfer/recycling infrastructure such as solid waste buy-back centres (plastic, paper, rubble, composting plant); and

- Adopt green procurement policy and practices in the City of Johannesburg and the municipal owned entities over a period of five years from 2004 to encourage procurement of biodegradable products and promoting responsible waste disposal practices. The green procurement policy is currently a draft and has not been adopted to date.

The City of Johannesburg (2003(b):8-9) has established an Environmental Management Co-ordinating Committee (EMCC) to co-ordinate the implementation of the policy. However, the EMCC has not held any meeting in the previous 12 months. In terms of financing, a waste management fund has

been provided in the budgeting process of the City. The following has to be regulated and fast tracked: Waste infrastructure development projects, community co-operatives and programmes that include household waste separation initiatives, recycling programmes and the establishment of buy-back centres. Accessibility to such infrastructure and financial incentives shall be carefully considered to allow the community cooperatives to become fully sustainable business entities, adequately positioned to service the business and industry sectors over time.

In terms of solid waste recycling, the City of Johannesburg (2003(b):10-11) undertakes to do the following:

- Protect the use of natural resources by encouraging waste reduction, and the re-use and recycling of materials. The City has implemented this programme through awareness raising campaign by doing river clean up campaigns.

- Develop and introduce economic instruments such as a deposit system and waste disposal charge system based on quantities of waste being disposed, favouring recycling industries and protecting natural resources. The City has only implemented the waste disposal discharge system.

- Establish recycling campaigns and business partnerships to establish an economic environment, especially in previously disadvantaged areas (thereby stimulating job creation and enterprise development). The City had not developed any formal business partnerships with at the time of the research.

- Increase waste infrastructure development over the next five years to improve integrated waste management, while establishing facilities such as transfer stations, waste treatment facilities, and buy-back centres (thereby encouraging resource recovery). This paragraph will be further discussed under section 3.3.4 whereby all the programmes that the City has implemented are discussed; and

- Ensure that organised and controlled waste separation at source becomes more formalised (thus discouraging uncontrolled recovery at landfill sites). This paragraph will also be discussed in detail under

section 3.3.4 under projects and programmes for the City of Johannesburg.

In order to implement this policy, the Integrated Waste Management Plan would be developed according to the City of Johannesburg (2003:12). The Integrated Waste Management Plan will be discussed in the next section.

### 3.4.3 Integrated Waste Management Plan

The City of Johannesburg (2005:7) states that the Integrated Waste Management Plan (IWMP) conceptualises the first attempt at setting out a strategy for future waste management and planning for the City of Johannesburg. IWMP encourages a shift away from landfill disposal to land, towards more sustainable methods of minimisation and treatment of solid waste. The City of Johannesburg (2005:7) further states that reliance on disposal to land should no longer be the only option for the future. Current waste practices need to change, in order to avoid the loss of valuable resources in the waste and the risk of long-term pollution to the physical environment.

In terms of a resource recovery strategy, the City of Johannesburg (2005:16-17) asserts that the aim is to reduce the volume of waste requiring disposal while maximising the economic value of resources during its life cycle. This aim is to be obtained through re-use, recycling and reprocessing, and through energy recovery preference to disposal.

According to the City of Johannesburg (2005:17), the key factors in resource recovery include the following:

- Understanding the availability of materials.
- Identifying opportunities to divert resources from waste stream through an understanding of potential markets for materials.
- Identifying quality and performance requirements critical to market success.
- Removing impediments to legitimate diversion and market development.
- Facilitating diversion of waste from landfill through increased resource recovery infrastructure and financial incentives; and
- Waste separation at source and appropriate waste collection and transport systems to handle separated waste.

Table 3.3 below was extracted from the Integrated Waste Management Plan. Table 3.3 presents a summary of the Integrated Waste Management Plan according to the City of Johannesburg (2005: 26-28). Summary of the table is discussed at the end of the table.

**Table 3.3 Summary of the Integrated Waste Management Plan**

| STRATEGIC INTIATIVES | ACTIVITIES | TARGET | FINANCIAL REQUIREMENTS | PROGRESS TO DATE |
|---|---|---|---|---|
| **Legislative and Regulatory** | Set legislated targets | Targets set by 2005 | R 50 000 | Awaiting national government to promulgate the National Waste Bill of 2006 |
| | Amend by-laws to include provision for requirement of industry waste minimisation plans | By laws amended by November 2006 | R 100 000 | Awaiting national government to promulgate the National Waste Bill of 2006 |
| | Amend by-laws to require separation at source | By laws amended by November 2005 | R 100 000 | Awaiting national government to promulgate the National Waste Bill of 2006 |
| | Develop appropriate legal framework for waste minimisation and recycling | Waste minimisation and recycling provisions incorporated into by laws by November 2005 | R 100 000 | Awaiting national government to promulgate the National Waste Bill of 2006 |

| | | | | |
|---|---|---|---|---|
| | Make waste minimisation an integral part of licensing procedures. | System introduced in October 2005 and review all licensed by December 2005 | R 50 000 | Awaiting national government to promulgate the National Waste Bill of 2006 |
| **Economic Instruments** | Investigate the feasibility of introducing economic instruments | Study to Commence by August 2006 | R 50 000 | No progress |
| | Identify alternative markets for recyclable products | Markets identified by December 2006 | R 100 000 | No progress |
| **Information / Communication** | Develop information and communication programs for civil society and private sector | Information Dissemination program developed by September 2006 | R 1m | The City has developed a waste hub which captures information on the transporters of waste. The system is no functioning optimally as there is no information on the quantities of was |
| | Develop and display public information sheets | Information sheets developed by October 2006 | R 200 000 | Done |

| | | | | |
|---|---|---|---|---|
| | Provide information on Council and PIKITUP website | Information available by February 2007 | R 500 000 | Done |
| | Develop and implement a promotional campaign | Campaign to start in March 2006 | R 1m | Done |
| | Develop Council waste minimisation and recycling program | Commence in November 2007 | R 1m | To a limited extent, the City has facilitated the development of the Zondi solid waste buy-back centre and has budgeted R 3, 3 million to assist with the establishment and operation of the solid waste buy-back centres. |
| | Develop Green procurement guide for the City | Guidelines developed by December 2007 | R 100 000 | The green procurement policy is currently a draft and has not been adopted. |
| | Produce quarterly Recycling | First issue by March 2007 | R 1m | No progress |

| | | | | |
|---|---|---|---|---|
| | publication for the City | | | |

| STRATEGIC INTIATIVES | ACTIVITIES | TARGET | FINANCIAL REQUIREMENTS | PROGRESS TO DATE |
|---|---|---|---|---|
| **Recycling Infrastructure Development** | Promote separation at source | Separation at source to commence June 2009 | None stated | Pilot study has been undertaken in Lonehill, North Johannesburg |
| | Develop and implement a pilot project for kerbside collection of recyclables | Pilot projects established at each region by June 2006<br>Projects to commence June 2006<br><br>Pilot project developed by June 2006 and implementation to begin in 2007 | R 10 m | Pilot study has been undertaken in Lonehill, North Johannesburg |
| | Develop and implement a pilot project for the collection of fluorescent tubes, small batteries, tyres and vehicle batteries | Pilot project developed by 2007 | R 5m | No progress to date |
| **Waste** | Formalise waste reclamation at | Reclamation formalise by | Study required | Study required |

| | | | | |
|---|---|---|---|---|
| **minimisation and recycling** | landfill sites | 2006 | | |
| | Establish new recycling programs | Recycling programs established at each region by 2006 | City of Johannesburg | Has only been established in 2 regions out of 7 regions |
| | Establish new buy-back centres | New buy-back centres established at each region by 2006 | R 5m | Has only established one buy-back centre and has committed R 3,3 million to establish other two buy-back centres |
| | Establish composting facilities | Composting facilities established at each landfill site by 2005 | R 10m | Done |
| | Research alternative / appropriate technologies for recycling | Research completed by 2007 | R 100 000 | No progress |
| | Establish a private public partnership for the collection of recyclables and management of recycling facilities | Partnership established by may 2007 | Detailed study | No progress |
| **Education and** | Under take need analysis on | December 2007 | | No progress on the |

| | | | | |
|---|---|---|---|---|
| **Awareness programmes** | education, awareness and capacity<br>Design education and awareness program. | March 2006 | | need analysis, however there are ad hoc education and awareness campaigns such river clean ups and publishing of posters. The City has appointed a manager to oversee education and awareness |
| | Conduct education, awareness and capacity building program | Continuous | City of Johannesburg | There are ad hoc education and awareness campaigns such river clean ups and publishing of posters. The City has appointed a manager to oversee education and awareness |

| | | | | |
|---|---|---|---|---|
| | Investigate feasible methods of waste minimisation | December 2007 | R 100 000 | No progress |
| | Encourage separation at source to achieve waste minimisation and recycling | July 2008 | R 1m | There are ad hoc education and awareness campaigns such river clean ups and publishing of posters. The City has appointed a manager to oversee education and awareness |
| | Formalise reclamation at landfill sites to minimise waste going to landfills | December 2008 | R 1m | Done |
| | Work closely with the provincial and national government to develop and<br>Incorporate waste minimisation and recycling education into school curriculum | Commence in 200 June 2008 | No funds indicated | No progress |

**Summary of the table's commitments**

According to the City of Johannesburg (2005:48), the majority of recycling is dependent upon market forces, which dictate the level of recycling that is economically viable. It is unlikely however, that those initiatives that rely on market forces only, will be sustainable in the long-term in the absence of economic instruments to support and promote recycling programme such as the establishment of solid waste buy-back centres. There is no economic incentive for waste generators to reduce the quantities of waste generated through waste prevention or minimisation, or through diversion of waste from landfill to recycling.

A limited number of economic instruments to promote recycling are available for implementation by the local authority. According to the City of Johannesburg (2005:48), the three levels of government therefore need to co-ordinate and integrate their approach to implement economic instruments and to consult widely with key stakeholders.

The next section discusses programmes that have been implemented since 2006 and intended for the financial years of 2008-2009. These programmes are based on the Integrated Waste Management Plan of 2005.

### 3.4.4 The City Of Johannesburg's Solid Waste Management and Recycling Programmes

According to the City of Johannesburg (2008:94), the Integrated Development Plan (IDP) of the City is a comprehensive, integrated and multifaceted document that seeks to achieve a number of objectives and imperatives. The IDP is used as tool for planning the 5 year programmes during the tenure of the mayor. The IDP as a planning tool for the programmes is based on consultations with the community through the speaker's office that channels all communications political appointments. The community defines broad priorities during IDP community outreach programmes. The rationale for developing an IDP in the City is that:

- The IDP is part of strategic planning instruments that guide development and service delivery in the City; and

- The IDP sets out the strategic plan for the medium term that coincides with the 2006-2011 electoral term. Each Department and Municipal Entity (ME) is required to complete a detailed annual business plan that gives operational expression to the IDP.

Waste management in the City is a concurrent function of the Environment Department and the Infrastructure and Services Department. The IDP sector's plans for these two city departments responsible for waste management are discussed below in the next section.

**A) Environment Department**

The City of Johannesburg (2008:141) states that the five strategic objectives (2006-2011) of the Environment Department with regards to waste managernent is to reduce the tons of waste disposed to landfill site by 15% on the 2006 baseline. The City of Johannesburg (2008:136) states that the Environment Department was established to provide environmental policies, strategies, plans, and to a certain extent, intervene in realising the goal of becoming a sustainable world class African City. One of the key focus areas of the Environment Department is waste policy and regulation.

The Environment Department works in conjunction with the Infrastructure and Services Department (ISD), Environmental Health and Pikitup (the City's waste services company) to ensure that a pro-active strategy is implemented to reduce illegal dumping. The strategy includes a feasibility study on changing the current practice of waste storage, collection and disposal, to explore material recovery throughout the City. According to the City of Johannesburg (2008: 138), a 360-degree turn on current waste management practice is needed in order to meet the Polokwane Declaration targets. The 360-degree turn is needed because the City is facing a backlog with programmes as indicated in table 3.3 in order to effect the targets of the Polokwane Declaration.

The City of Johannesburg (2008:141) states that the following have been achieved in terms of waste management since 2006:

- Illegal dumping hotspots have been identified and cleared.

- Waste operators (533) who transport waste within the City have been licensed.
- Fines worth R 815 000 have been issued to unlicensed waste transporters.
- The establishment of a buy-back centre in one region of the City has been initiated; and
- The Zondi buy-back centre has been upgraded in another region. The buy-back centre has achieved the following since 2003 per annum:
    - 44 tons of glass have been collected;
    - 44 tons of plastic have been collected;
    - 36 tons of paper have been collected; and
    - 6 tons of can have been collected.

The City of Johannesburg (2008:141) asserts that for the financial year 2008-2009, the following projects will be implemented in pursuance of the goals of the Polokwane Declaration:

- Establish and operate 4 buy-back centres (Alex, Orange Farm, Cosmo and inner city) to encourage waste reduction at source.
- Data capture and analyse waste to inform planning and decision-making.
- Separate waste at the head office.
- Develop guidelines on waste minimisation at major events in order to reduce the amount of waste to landfill; and
- Investigate the feasibility of material recovery facility for recyclable waste versus the buy-back centres.

**B) Infrastructure and Services Department**

The City of Johannesburg (2008:206) states that on an annual basis approximately 1, 4 tons of waste is managed. The waste is deposited at four landfill sites. The substantial increase (10%-14% per annum) in waste volumes has resulted in an accelerated reduction of landfill airspace. The Infrastructure and Services Department (ISD), together with Pikitup, will introduce a waste treatment technology project which will entail the extracting of gas from the landfill and converting it to energy. This project is expected to assist in meeting

the Polokwane Declaration's commitment of removing waste from landfill with at least 70% by 2022.

The five (5) year IDP strategic objective (2006-2011) in terms of solid waste recycling of the ISD aims to:

- Reduce, re-use and recycle with at least 15% waste by 2010; and
- Develop and implement a strategy to increase landfill capacity.

In terms of solid waste recycling, the ISD has since 2006 diverted 38 756 tons of waste away from landfill through recycling and composting activities.

In the 2008-2009 financial years, the ISD intends to implement the following projects:

- Commission and monitor the implementation of the Landfill Gas to Energy project.
- Implement alternative technologies for waste reduction and treatment.
- Develop legislation that will enable the minimisation of waste generation; and
- Develop a landfill management strategy.

In the next section the conclusion on Chapter 3 of the research will be discussed.

## 3.5 CONCLUSION

South Africa has national legislation that addresses the management of solid waste but is not strong on solid waste recycling probably because of the infrastructure required to enforce solid waste recycling programmes such as the provision of containers for recyclables and collection thereof. The strategies and guidelines on solid waste recycling are very detailed and comprehensive. However, the biggest drawback in implementing these strategies is the lack of supporting legislation that forces the public to recycle solid waste. The challenge is to develop, implement and enforce legislation (such as waste separation at source) to force the public to recycle solid waste. The lack of supporting solid waste recycling infrastructure (such as storage and collection facilities) for recyclable solid waste has led to solid waste recycling not being optimised in South Africa and in particular Johannesburg.

The introduction of special agencies, such as The Glass Recycling Company, Collect-a-can, the Paper Recycling Association of South Africa and the Plastic Federation of South Africa, has improved the levels of recycling. Nevertheless, the lack of co-ordination by private sector, the public and local government has resulted in the levels of solid waste recycling not being optimised.

The City of Johannesburg has developed some of the best strategies and plans to address solid waste recycling, but the lack off full implementation of these plans has compromised the achievement of the Polokwane Declaration targets. The Integrated Waste Management Plan is not properly aligned with the five year IDP objectives and projects of the Environment Department and ISD. The Environment Department and ISD do not have a formal working arrangement where plans and implementation of projects are properly co-ordinated.

The investigation and implementation of some of the economic instruments, such as incentives to recycle, a tax break for recyclers, a deposit system for other recyclable waste and fines, can promote optimal solid waste recycling. The investigations of these economic instruments are mentioned in the Integrated Waste Management Plan. Conversely, they are not mentioned in the five year IDP programmes of the two City Departments (Environment and Infrastructure and Services).

The full implementation of the Integrated Waste Management Plan could have resulted in the business of establishing a solid waste buy-back centre being more viable.

In the next chapter the empirical studies on the establishment and operation of a solid waste buy-back centre will be discussed as the buy-back centres play a vital role in the value chain of solid waste recycling. The solid waste buy-back centres serve as a linkage between the communities participating in recycling programme and the industries using recyclable solid waste material. In the value chain of solid waste recycling they can be described as intermediaries within the distribution network.

# CHAPTER 4: THE VIABILITY OF ESTABLISHING SOLID WASTE BUY-BACK CENTRES

## 4.1 INTRODUCTION

The discussion in Chapter 2 and 3 about the success of the solid waste recycling programmes which affect the solid waste buy-back centres indicated that the success of recycling depends on a number of factors. These include the public's participation in recycling programmes, market factors such as the price of recyclable materials and awareness of the benefits of solid waste recycling, availability of infrastructure to run a solid waste recycling business, and institutional support mechanisms. A qualitative survey was undertaken on a sample of solid waste buy-back centres within the City of Johannesburg. The survey was done in order to identify challenges, gain better insight on what works at the solid waste buy-back centres, and to verify the facts in the study thus far.

The survey provided new insight on the challenges that buy-back centres are facing, for example the need for bigger land to run buy-back centres, business training support and the need to form partnerships with the local government, recycling industries and communities. In the next section the sample selection will be discussed.

## 4.2 RESEARCH METHODOLOGY

### 4.2.1 Sample Selection

A database of solid waste buy-back centres within the City of Johannesburg was sourced from the City's Environmental Management Department. The database consisted of 17 solid waste buy-back centres of which two were no longer operational, therefore limiting the sample population to 15 solid waste buy-back centres. Eight buy-back centres were randomly selected from the population list to conduct the survey using *PHSTATS* software random number generator. Eight buy-back centres were considered sufficient in representing more than 50% of the population. It was difficult to get other buy-back centres to respond

as most indicated time constraints. The next section discusses how data was collected.

### 4.2.2 Data Collection

The list provided by the Environment Department contained the names and telephone numbers of contact persons. Due to low response rates associated with sending out questionnaires and because of the time constraints of travelling to each buy-back centre around the City of Johannesburg, telephonic interviews were deemed the most feasible option for collecting the data. The challenge that was experienced with conducting the telephonic interviews was to establish trust from the respondents. As such it was not easy to get information on the finances under Section E of the questionnaire. The financial information that respondents were unwilling to share was therefore estimated and calculated by using the quantities of recyclable solid waste received. Two of the solid waste buy-back centres had no time to respond to the telephonic interview and subsequently two other buy-back centres had to be selected from the database. The questionnaire is discussed in the following section.

### 4.2.3 Questionnaire

The questionnaire was used as the sole method of collecting the empirical data. The first two themes of the questionnaire consisted of categorical data in order to allow the categorising of the entrepreneur's profile and the geographic profile, in particular the location of the solid waste buy-back centres. The last four themes of the questionnaire consisted of open-ended questions and some categorical questions to assist the interviewee with responses. A sample of the questionnaire is attached as Appendix A. In the next section the broad themes of the questions are discussed.

#### *4.2.3.1 The Questions*

The questions tested the success of the solid waste buy-back centres. The success for a solid waste buy-back centre is defined as a buy-back centre producing a net-profit. The expectation is that a successful solid waste buy-back centre will lead to increased rates of recycling.

The first and second categories of questions are categorical questions only. The third, fourth, fifth and sixth categories of question are both categorical and open-ended.

The questions in the questionnaire were classified into six broad categories:

1. **Entrepreneur profile** – this will be used to describe the profile of the entrepreneurs. The entrepreneurs in this study are defined as the people who have established and are operating the solid waste buy-back centre. The description of a typical entrepreneur operating a buy-back centre is expected to identify possible areas of intervention in order to optimise recycling rates and contribute to national government priorities such as black empowerment.
2. **Geographic profile** – the demographic profile is expected to identify the location of solid waste buy-back centres, and identify possible areas for intervention.
3. **Institutional support mechanism** – this will identify institutional support mechanisms such as availability of financial assistance that have caused solid waste buy-back centres to be successful and pinpoint the type of support required for success.
4. **Infrastructure analysis** – this will assist in answering the question of whether solid waste buy-back centres with infrastructure are more profitable. The infrastructure analysis will also reveal the number of solid waste buy-back centres with necessary infrastructure for example balers, storage facilities and land for operating the buy-back centre.
5. **Market and profitability analysis** – these questions have been designed to determine the relative profitability of the solid waste buy-back centres and the market of solid waste recyclables.
6. **General** – the questions under this theme were designed with the intention to elicit responses to questions that were important but not identified in the questionnaire.

**Table 4.1 Summary of the questions on the questionnaire**

| **Factor** | | **Question** |
|---|---|---|
| **Categorical questions** | | |
| A1 | Entrepreneur's profile | Gender of the business manager |
| A2 | Entrepreneur's profile | Race |

| | | |
|---|---|---|
| A3 | Entrepreneur's profile | Age |
| A4 | Entrepreneur's profile | Number of years in the business |
| A5 | Entrepreneur's profile | Educational level |
| A6 | Entrepreneur's profile | Prior business experience |
| B1 | Geographic profile | Business location |
| B2 | Geographic profile | Socio-economic status of households in the area business located |
| B3 | Geographic profile | Type of company |
| **Open-ended and some categorical questions** | | |
| | **Factors** | **Questions** |
| C1 | Institutional support mechanism | Business skills provided or receiving |
| C2 | Institutional support mechanism | Approaching a person or organisation for assistance to start the business |
| C3 | Institutional support mechanism | Rate of success in securing funds to start the business |
| C4 | Institutional support mechanism | Approaching the Council/City for assistance to start the business |
| C5 | Institutional support mechanisms | Additional support to assist in growing the business |
| D1 | Infrastructure analysis | Ownership of land |
| D2 | Infrastructure analysis | Availability of equipment on site |
| E1 | Market and profitability analysis | Average running costs of the business per month |
| E2 | Market and profitability analysis | Average monthly net-profit |
| E3 | Market and profitability analysis | Number of staff employed in the business |
| E4 | Market and profitability analysis | Key partnership with other role players |
| E5 | Market and profitability analysis | Average quantities of recyclable waste received per month |

| | | |
|---|---|---|
| E6 | Market and profitability analysis | Trend of the solid waste recyclable that increased most and reason thereof |
| F1 | **General** | **Any other information** |

The results of the survey are discussed in the next section.

## 4.3 SURVEY RESULTS ON THE VIABILITY FOR ESTABLISHING SOLID WASTE BUY-BACK CENTRES

### 4.3.1 Introduction

The survey generated very useful information on the entrepreneurs' profile and on the demographic profile of where solid waste buy-back centres are located. The survey also generated useful insight on the challenges that solid waste buy-back centres are facing. In addition, the survey identified some of the factors sustaining the solid waste buy-back centres' profit.

The findings furthermore revealed some disconnections amongst the role players in the solid waste recycling industry, specifically government, recycling industries, recycling entrepreneurs, civil society and agencies involved in recycling, in terms of co-ordination. The next section discusses the research sample.

### 4.3.2 Data Analysis

The data has been analysed in a form of a percentage contribution of each variable to a specific question.

The data analysis is presented in a form of a pie chart for the categorical data using Microsoft *Excel* for ease of reference and interpretation. Data from open ended questions is presented in summarised bullet point format.

### 4.3.3 Factor Analysis

#### *4.3.3.1 General*

During the first telephone interview it was found that two of the questions in the initial questionnaire overlapped (the question on the business skill of the entrepreneur who starts a business, and the question on whether business skills were being provided or received). The questionnaire was subsequently revised for the follow-up interviews. The interviewees were not willing to share exact financial information but provided estimates within the financial parameters that were asked.

The next section discusses the entrepreneur's profile.

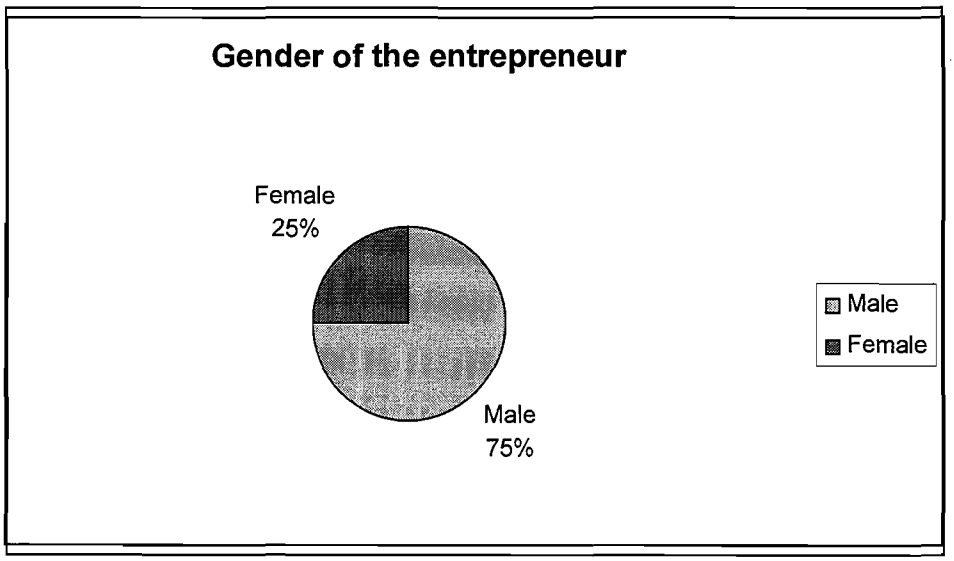
### *4.3.3.2 The Entrepreneur Profile*

These questions were set in order to provide a profile of the entrepreneurs involved in the solid waste recycling business.

**Question A1 - Gender of the entrepreneur.**

Figure 4.1 represents responses to question A1, and shows that 75% of the entrepreneurs that operate the solid waste buy-back centre business is male while the other 25% is female.

**Figure 4.1 Gender of the entrepreneur**

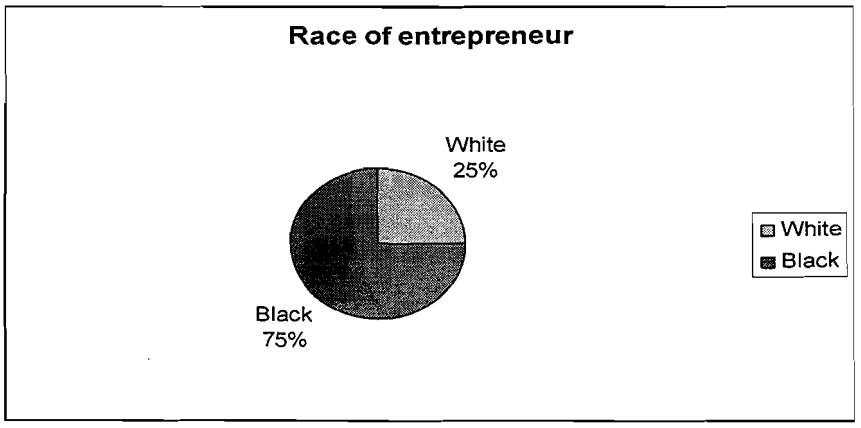



**Question A2 - Race of the entrepreneur.**

Figure 4.2 represents the race of the entrepreneur and the result is as follows:

- 75% of the entrepreneurs running the solid waste buy-back centres were black; and
- 25% of the entrepreneurs running the solid waste buy-back centres were white.

**Figure 4.2 Race of the entrepreneur.**

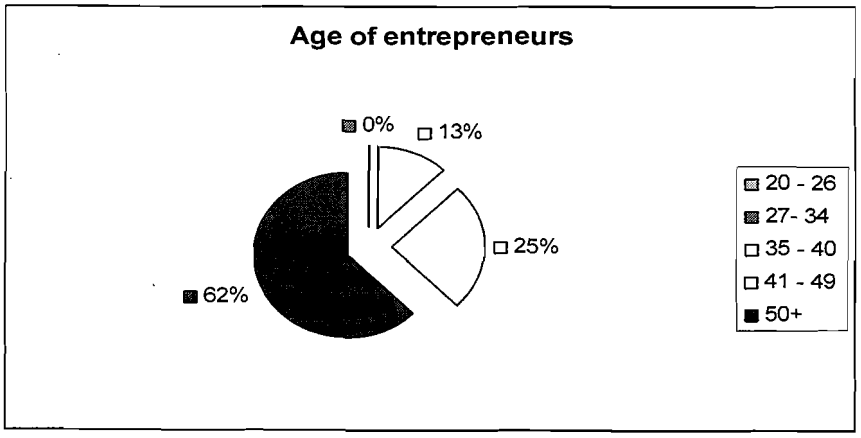



**Question A3 - Age of the entrepreneur.**

Figure 4.3 represents the age of the entrepreneur. The results are as follows:

- 63% of the entrepreneurs running the solid waste buy-back centres were above the age of 50 years;
- 25% of the entrepreneurs running the solid waste buy-back centres were between the age of 41 and 50 years; and
- 12% of the entrepreneurs running the solid waste buy-back centres were between the age of 35 and 40 years.

**Figure 4.3 Age of the entrepreneur**

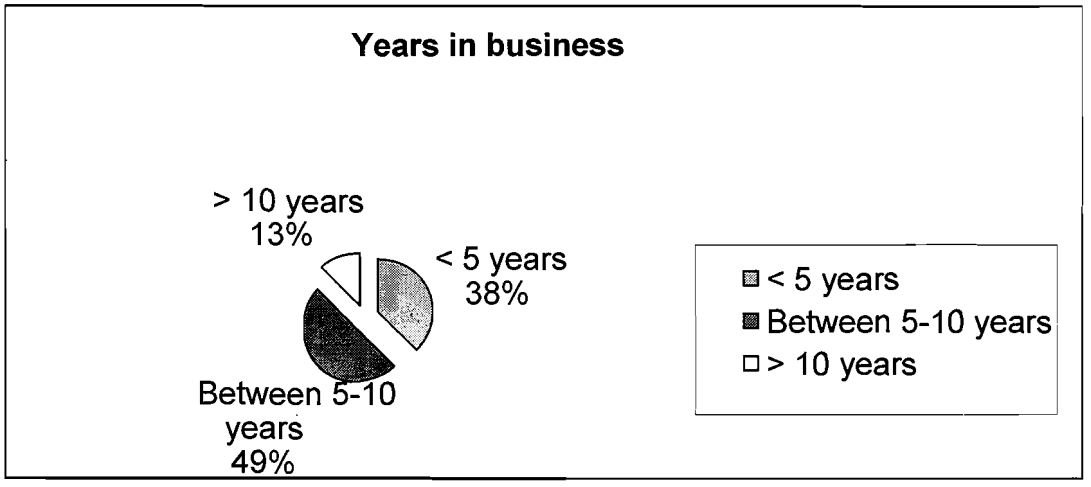


**Question A4 - How long has the entrepreneur been in business?**

Figure 4.4 represents the number of years that the entrepreneurs have been in business. The results are as follows:

- 38% of the entrepreneurs have been in the solid waste buy-back centres for less than five years;
- 50% of the entrepreneurs have been running the solid waste buy-back centres for a period between five and ten years; and
- 12% of the entrepreneurs have been running the solid waste buy-back centres for more than ten years.

**Figure 4.4 Years in business**

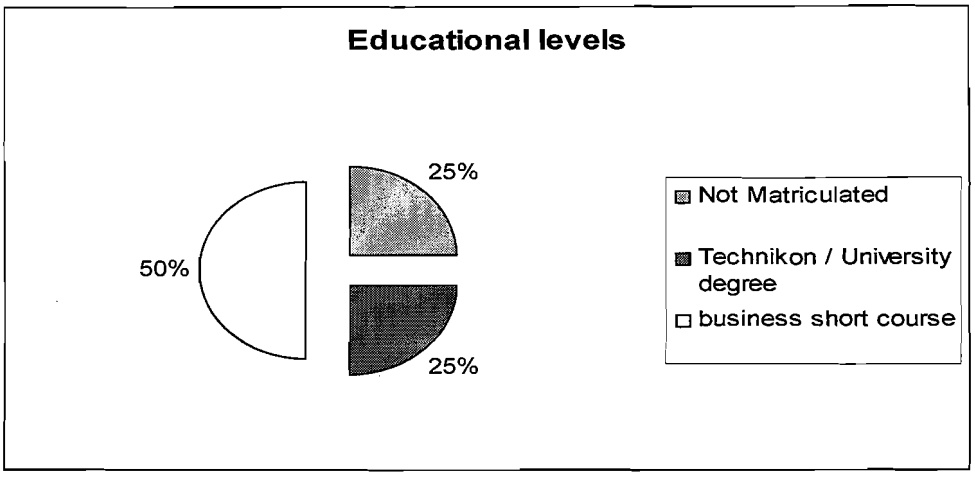



**Question A5 - Educational level of the entrepreneurs.**

Figure 4.5 represents the educational levels of the entrepreneurs and the results can be summarised as follows:

- 50% of the entrepreneurs have completed short courses in business;
- 25% of the entrepreneurs have a university degree; and
- 25% of the entrepreneurs have no Matric certificate.

**Figure 4.5 Educational levels**

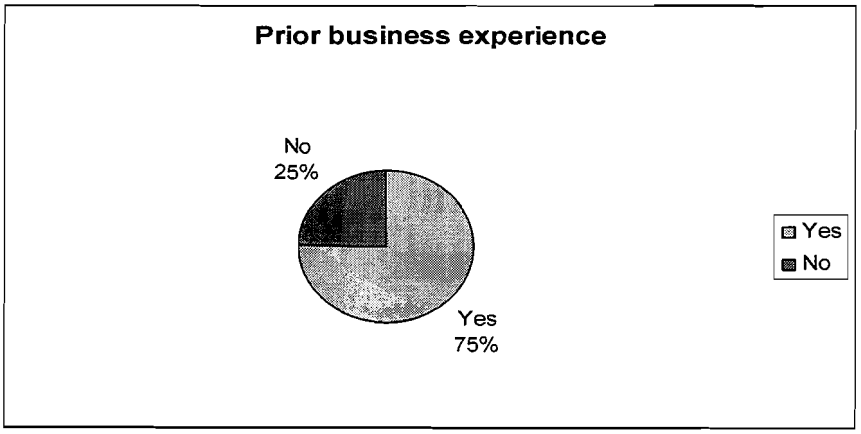



**Question A6 - Business experience of the entrepreneurs prior to running the solid waste recycling business.**

Figure 4.6 represents the business experience of entrepreneurs prior to establishing a solid waste buy-back centre business. The result can be summarised as follows:

- 75% of the entrepreneurs had some business experience prior to running the solid waste recycling business; and
- 25% of the entrepreneurs had no business experience prior to running the solid waste recycling business.

**Figure 4.6 Prior business experience**



#### 4.3.3.2.1 Summary of the entrepreneur's profile

The above results indicate that most of the solid waste buy-back centres are run by males and that most are above the age of 50 years. Most of the buy-back centres (75%) are run by blacks and this can be a possible area of intervention in promoting black entrepreneurship in line with government strategy.

The majority of these entrepreneurs have been running the solid waste buy-back centres for a period of between five and ten years and most of the entrepreneurs have completed short courses in business. The overwhelming majority (86%) of the entrepreneurs, had business experience prior to running the solid waste recycling business. The geographic profile where solid waste buy-back centres are located is discussed in the next section.

### *4.3.3.3 The Geographic Profile*

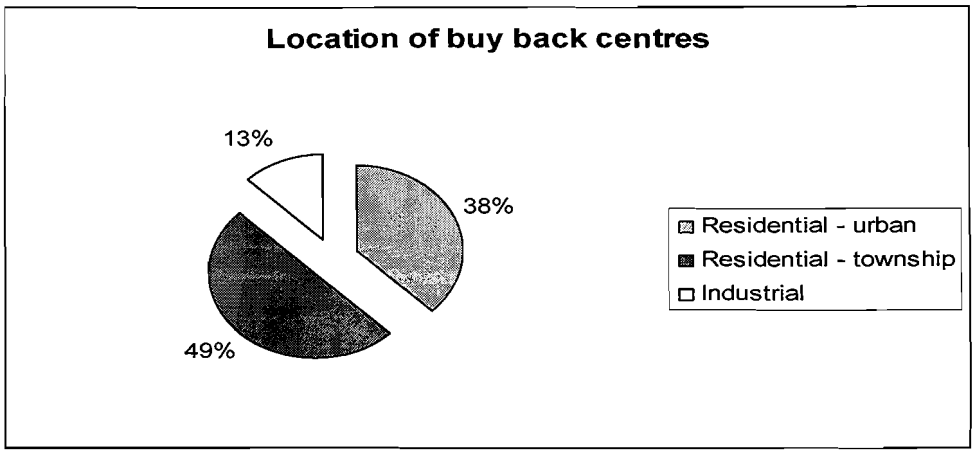
The questions on the geographic profile were crafted with the intention of getting an indication of the geographic profile of the areas where the solid waste buy-back centres are located. The knowledge on the geographic profile will assist the City of Johannesburg with identification of areas where buy-back is needed.

**Question B1 – Area where the solid waste buy-back centre is located.**

Figure 4.7 represents the percentage spread of where solid waste buy-back centres are located. The results are follows:

- 50% of the solid waste buy-back centres are located in township residential areas;
- 38% of the solid waste buy-back centres are located in urban residential areas; and
- 12% of the solid waste buy-back centres are located in industrial areas.

**Figure 4.7 Location of buy-back centres**

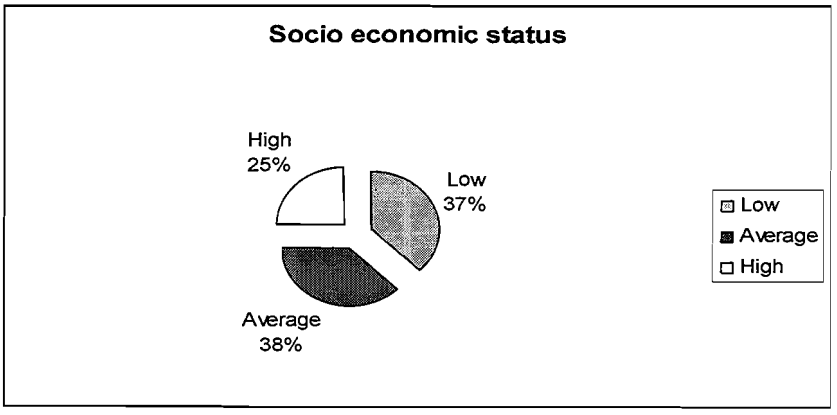



**Question B2 - The socio-economic status of people living in the area.**

Figure 4.8 represents the socio economic status of people living in the area where the solid waste buy-back centres are located. Low socio-economic status indicate people falling within the range of the 1 – 4 Living Standard Measure (LSM), Average socio-economic status fall in the 4 – 7 LSM and high socio-economic status fall in the 8 – 10 LSM category. The results are as follows:

- 38% of the solid waste buy-back centres are located in areas with low socio-economic status;
- 38% of the other solid waste buy-back centres are located in areas with average socio-economic status; and
- The rest of the buy-back centres, (24%), are located in areas with high socio-economic status.

**Figure 4.8 Socio economic statuses**



**Question B3 - Type of company.**

The percentage and type of companies that are solid waste buy-back centres. The results are as follows:

- 38% of the solid waste buy-back centres are closed corporations;
- 38% of the solid waste buy-back centres have sole owners; and
- 24% of the solid waste buy-back centres are owned by community trusts.

***4.3.3.3.1 Summary of Geographic Profile***

The majority of solid waste buy-back centres are located within township residential areas. The socio-economic status of the areas where the solid waste buy-back centres are located is mostly low to average. The location of solid waste buy-back centres in areas with low to average socio-economic status indicate that they contribute to job creation and community entrepreneurship in areas with these socio-economic status. Most of the solid waste buy-back centres are closed corporations and have sole owners; therefore the establishment thereof are mostly driven by private initiatives rather than communities. The implications are that the City of Johannesburg in their strategy to establish solid waste buy-back centres will need to approach communities in order to increase the number of community groups owning solid waste buy-back centres. The next section discusses what institutional support mechanisms are present and lacking.

***4.3.3.4 Institutional Support Mechanism***

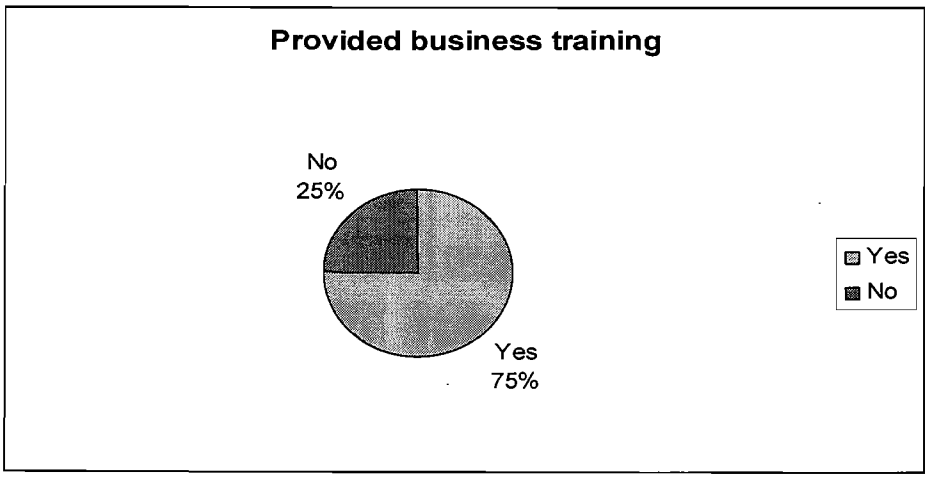
The questions under this section were open-ended questions with the aim of eliciting responses that would shed light on whether the entrepreneurs had current or past institutional support to assist them in undertaking optimal solid waste recycling. The responses to the question on whether the entrepreneurs were provided with any business training are discussed in the next section.

**Question C1 - Entrepreneurs and business skills.**

Figure 4.9 represents the percentages of entrepreneurs that have been provided with business. The result is as follows:

- 25% entrepreneurs have not been provided with any business training
- 75% of the entrepreneurs have been provided with some of the following business skills / experience:
    - Running their own businesses, such as saw milling, pet food business and grocery shop
    - Running other buy-back centres
    - Collecting waste from shopping centres
    - Working for some Corporate's waste division, for example MNET
    - Training from Mondi (paper recycling)
    - Mentorship training in running a business; management development; programme development; financial management; marketing; life skills; project management; tendering and costing.

**Figure 4.9 Entrepreneurs that have been provided with business training**

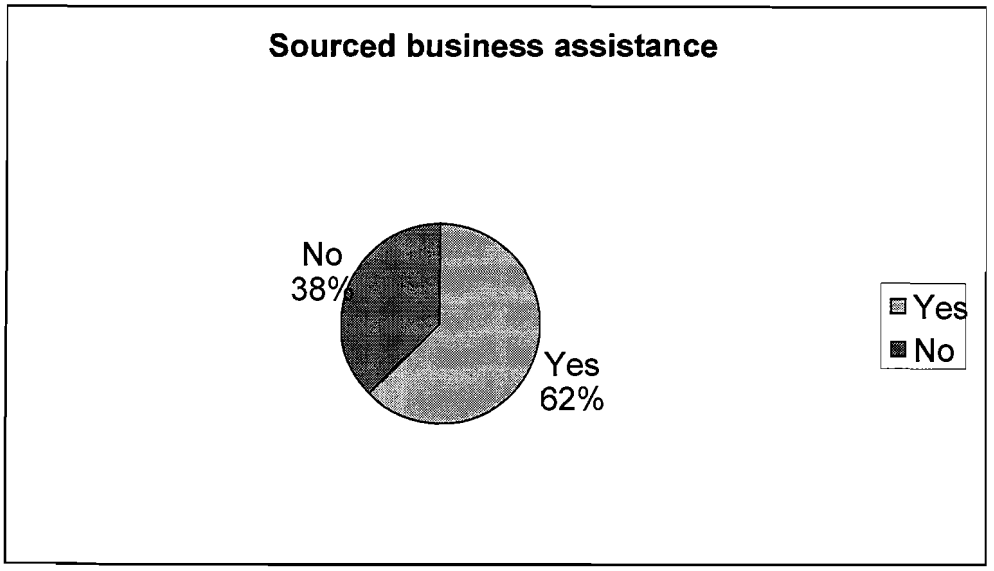



**Question C2 - Sourced assistance in starting the business.**

The percentage of entrepreneurs that sourced assistance in establishing the solid waste buy-back centres business is represented in Figure 4.10 and can be summarised as follows:

- 38% of the solid waste buy-back centres did not approach anybody for assistance in starting the business as they were not aware of any help that is available.
- 62% of the solid waste buy-back centres received assistance from some of the following organisations / institutions:
    - The Canadian government – money grant and technical assistance
    - A major recycler (Mama She) – provision of equipment and technical assistance
    - A waste collector for the City of Johannesburg – technical assistance
    - Glass and paper recycling companies (Consol and Mondi) – provision of equipment and technical assistance
    - United Nations Development Programme – technical assistance
    - The National Department of Environmental Affairs and Tourism – money grants, provision of equipment and technical assistance
    - City of Johannesburg (Environment Department) – land and technical assistance
    - National Department of Social Services – money grant.

**Figure 4.10 Sourced assistance in establishing the business**

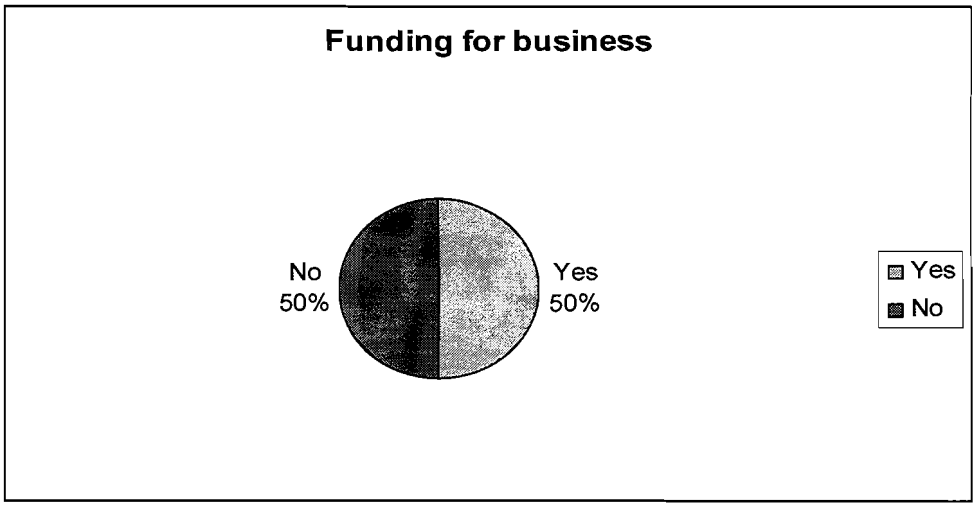


**Question C3 - Solid waste buy-back centres and funding for starting the business.**

Figure 4.11 represents the number of solid waste buy-back centres that received funding in order to establish the business. The result is as follows:

- 50% of the solid waste buy-back centres have not received any funding to start the business.
- 50% of the solid waste buy-back centres received a percentage of their funding from the following organisations:
    - National Department of Social Services
    - National Department of Environmental Affairs and Tourism
    - Canadian Government.

**Figure 4.11 Funding for business**



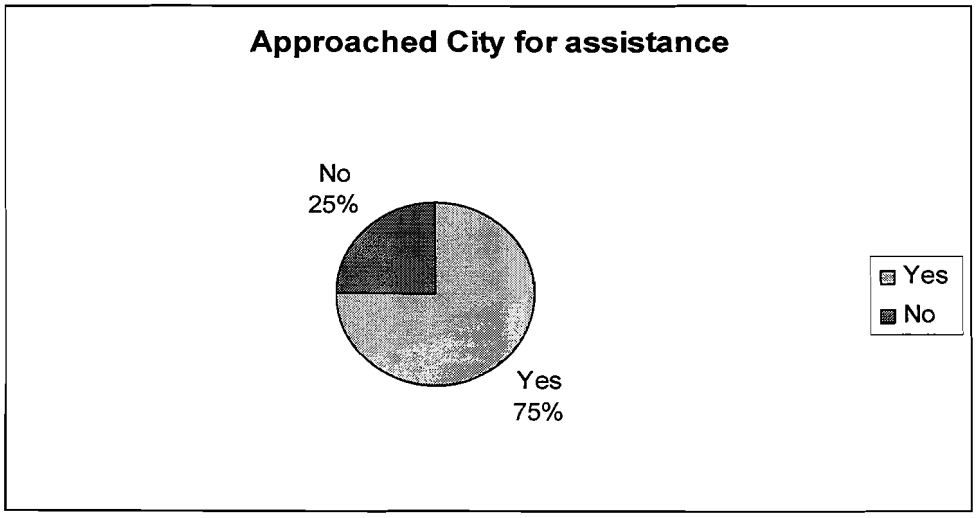

**Question C4 - Approaching the Council/City for assistance to start the business.**

The percentages of entrepreneurs that have approached the City for assistance are represented in Figure 4.12 and can be summarised as follows:

- 25% of the entrepreneurs did not approach the City of Johannesburg Council for business assistance as they were not aware that assistance is available.

- 62% of the entrepreneurs approached the City of Johannesburg Council for business assistance but did not receive any assistance because these were not the right Departments to offer assistance. The Departments that were approached were:
    - Johannesburg City Property Company – for land
    - Social Department – for funding
    - Pikitup – for equipment.
- The Department that managed to offer technical assistance to 13% of the solid waste buy-back centres was the Environmental Management Department.

**Figure 4.12 Approached the City for assistance**




**Question C5 - Additional support to assist in growing the business.**

The entrepreneurs indicated their need for the following assistance to grow the business:

- Partnerships with government, schools, churches, clinics – 25% of entrepreneurs;
- Making more land available – 75% of entrepreneurs;
- Training – 50% of the entrepreneurs;
- Infrastructure – 38% of the entrepreneurs;
- Equipment – 38% of the entrepreneurs;
- Shelter – 13% of the entrepreneurs; and

- Transport for collecting and transporting recyclables to industries – 38% of entrepreneurs.

The entrepreneurs did not mention the need to link up with any BBBEE initiatives in terms of Companies that use recyclable material procuring from the solid waste buy-back centres owned by black in order to increase their BBBEE score, because they were not aware of the concept.

#### *4.3.3.4.1 Summary of the Institutional Support Mechanism*

Most of the entrepreneurs running the solid waste buy-back centres have acquired some kind of business skills. There are 62% of entrepreneurs that received assistance from various institutions. There is no single dominant institution that has provided training. Half of the solid waste buy-back centres were started with no financial assistance. The training of entrepreneurs is not co-ordinated and the solid waste buy-back centres that have not received funding started very small and reinvested some of their profits in the business in order to grow their business. The lack of funding for entrepreneurs to start their business has resulted in that solid waste buy-back centre business growing very slowly.

The majority of entrepreneurs that approached the City of Johannesburg Council for assistance did not receive any assistance. The overwhelming majority of entrepreneurs, (75%), require assistance with the provision of bigger land to run the business. This is an area where the City Council of Johannesburg can assist. In the next section the infrastructure in the solid waste buy-back centres is discussed.

### *4.3.3.5 Infrastructure Analysis*

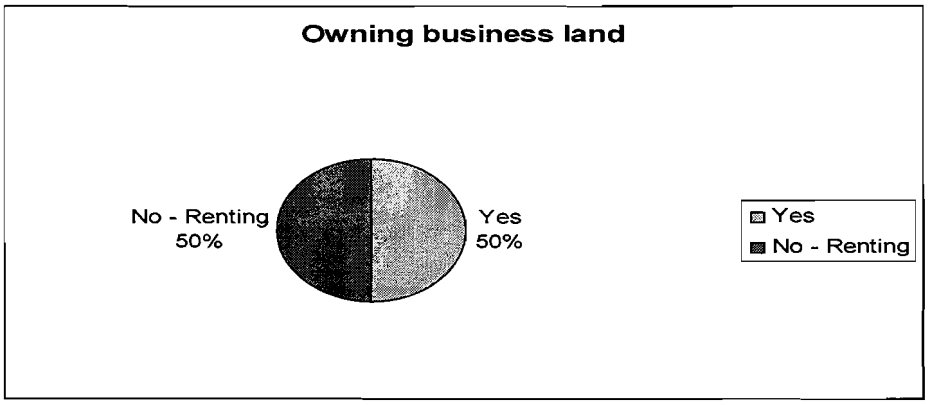
The questions under this topic are close-ended and research the issue whether the entrepreneurs have enough equipment on site to optimally recycle solid waste.

**Question D1 – Occupation of land by the entrepreneurs.**

Figure 4.13 represents the percentage of business that own land and those that are renting the land. The result is as follows:

There are 50% of entrepreneurs that own the land they operate their business on, while the other 50% rent the land. The 50% of entrepreneurs that rent land have indicated a desire to own their own land so that they can have freedom to expand their operations

**Figure 4.13 Owning business land**



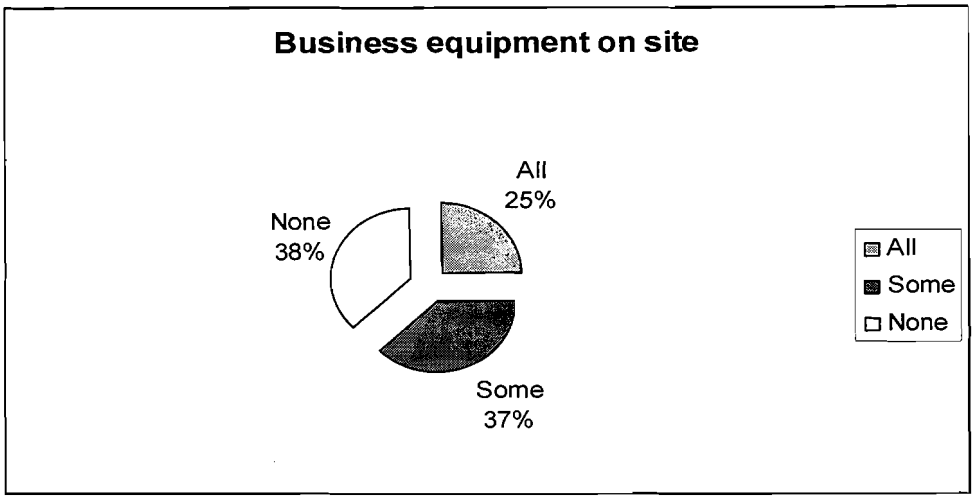

**Question D2 - Equipment available on site to run the optimal operations.**

Figure 4.14 represents the percentage of businesses that have the necessary equipment to operate their business optimally. The percentage spread is summarised as follows:

- 38% of the solid waste buy-back centres have no equipment on site;
- 38% of the solid waste buy-back centres have half of the equipment required to run operations optimally; and
- Only 24% of the solid waste buy-back centres have all the available equipment to run optimal operations.

The 38% of solid waste buy-back centres that have half the equipment required to run their business are effective to run their business (A net-profit of more than R20 000,00 per month is realised in this buy-back centres).

**Figure 4.14 Available equipment**




#### *4.3.3.5.1 Summary of the Infrastructure Analysis*

Half of the entrepreneurs own the land on which they run their businesses. 62% of the solid waste buy-back centres are not adequately equipped to run optimal recycling operations whereby they can produce net-profit of more than R30 000, 00. The institutional support mechanisms and availability of infrastructure have an impact on the operations of a buy-back centre. The next section discusses the market and profitability of solid waste buy-back centres.

#### *4.3.3.6 Market and Profitability Analysis*

The questions under this topic attempt to establish whether the market for solid waste recycling supports optimal recycling and whether the solid waste buy-back centres are running profitable operations.

Table 4.2 below is a summary of the market and profitability analysis of the solid waste buy-back centres that were sampled. The variables relating to the market and profitability analysis are further described and discussed in detail later in this section. The entrepreneurs interviewed were not willing to share exact information on the net-profit but were able to provide estimate with the parameters that were asked.

Table 4.2 indicates that one buy-back centre has a net-profit of less than R5 000, employs less than 5 people and receives less than 20 tons of recyclable

waste. The other three buy-back centres that receive between 31 and 40 tons of recyclable waste employ between 5 and 10 people and have a net-profit of between R5 000 and R10 000. The other 3 buy-back centres that receive more than 40 tons of recyclable waste employ more than 10 people and have a net-profit of more than R10 000.

Table 4.2 deduces that the business of solid waste buy-back centres is a business of the economic of scale as the more recyclable waste is received by the buy-back centre the more profitable they become, as evidenced by the buy-back centres receiving more than 40 tons of waste per month having a net-profit greater than R30 000 per month. The buy-back centres that receive more than 40 tons of recyclable waste create more employment for the community by employing more than 10 people in the business.

**Table 4.2 Summary of the market and profitability analysis**

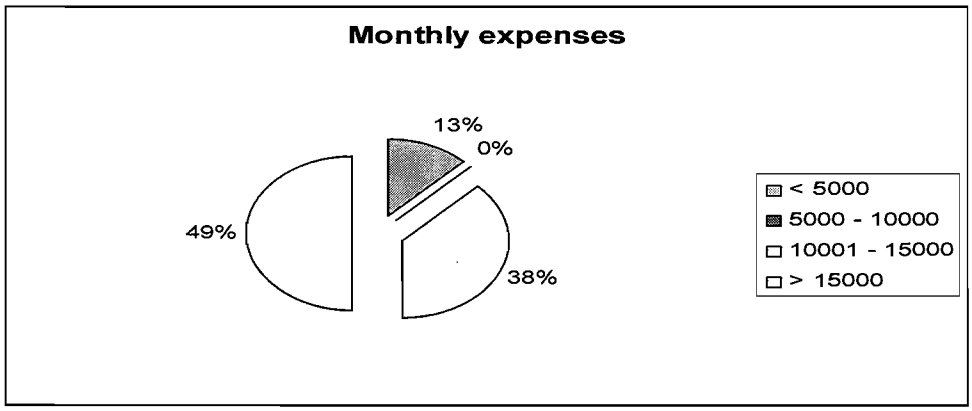
| | Solid waste buy-back centre 1 | Solid waste buy-back centre 2 | Solid waste buy-back centre 3 | Solid waste buy-back centre 4 | Solid waste buy-back centre 5 | Solid waste buy-back centre 6 | Solid waste buy-back centre 7 | Solid waste buy-back centre 8 |
|---|---|---|---|---|---|---|---|---|
| Average running monthly costs (R') | < 5000 | 10001 - 15000 | 10001 - 15000 | 10001 - 15000 | > 15000 | > 15000 | > 15000 | > 15000 |
| Average monthly turnover (R') | < 10000 & > 5000 | 20001 - 30000 | 20001 - 30000 | 20001 - 30000 | 20001 - 30000 | > 30000 | > 30000 | > 30000 |
| Number of staff employed | < 5 | btw 5 - 10 | btw 5 - 10 | btw 5 - 10 | > 10 | > 10 | > 10 | > 10 |
| average tons of waste received per month | < 20 | 31 - 40 | 31 - 40 | 31 - 40 | > 40 | > 40 | > 40 | > 40 |

**Question E1 - Average monthly costs to run the business.**

Figure 4.15 represents the expenses incurred by the solid waste buy-back centres on a monthly basis. The result can be summarised as follows:

- 13% of the solid waste buy-back centres have average costs less than R5 000 per month.
- 37% of the solid waste buy-back centres have average costs between R10 000 and R15 000 per month; and
- 50% of the solid waste buy-back centres have average costs of more than R15 000 per month.

**Figure 4.15 Monthly expenses of the business**

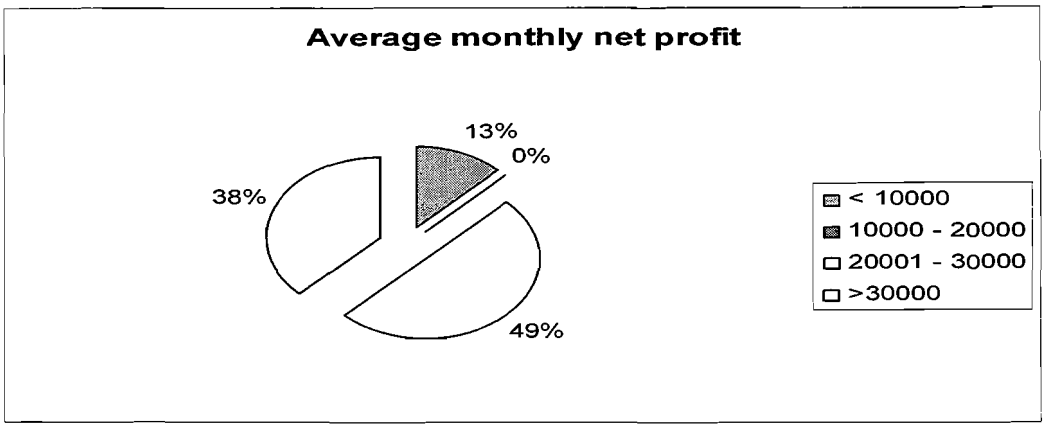



**Question E2 - Average monthly net-profit of the business.**

Figure 4.16 represents the average monthly net-profit of the solid waste buy-back centre business. The monthly net-profits are as follows:

- 13% of the solid waste buy-back centres have a monthly net-profit of less than R10 000 per month;
- 50% of the solid waste buy-back centres have a monthly net-profit of more than R20 000 per month; and
- 37% of the solid waste buy-back centres have a monthly net-profit of more than R30 000 per month.

**Figure 4.16 Average monthly net-profit**

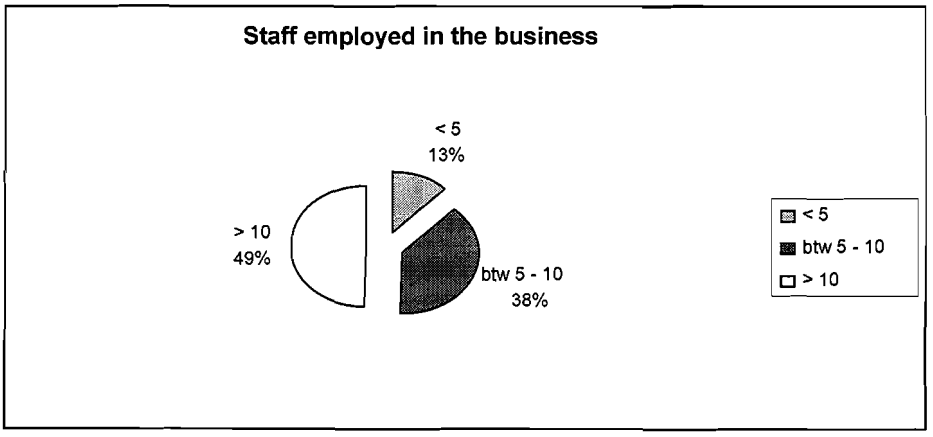



**Question E3 - Number of people employed in the business.**

Figure 4.17 represents the number of employees employed in the business and can be summarised as follows:

- 13% of the solid waste buy-back centres have less than five people employed;
- 37% of the solid waste buy-back centres have employed between five and ten people; and
- 50% of the solid waste buy-back centres have employed more than ten people.

**Figure 4.17 Number of employees in the business**



**Question E4 - Key partnerships with other role players in business.**

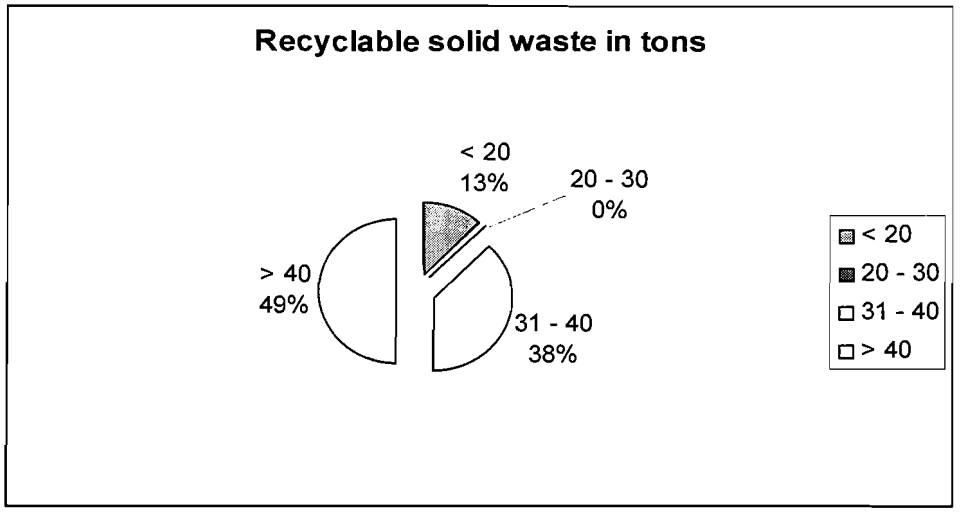
Some of the partnerships the entrepreneurs have formed in order to make their businesses more profitable are with shopping centres, schools, community organisations, churches and industries that recycle solid waste.

**Question E5 - Average quantities of recyclable solid waste received per month.**

Figure 4.18 represents the tonnages of recyclable solid waste received by the buy-back centres. The tonnages of recycled solid waste received by the buy-back centres are as follows:

- 13% of the solid waste buy-back centres receive less than 20 tons of recyclables waste per month on average;
- 37% of the solid waste buy-back centres receive between 30 and 40 tons of recyclable waste per month on average; and
- 50% of the solid waste buy-back centres collect more than 40 tons of recyclable waste per month on average.

**Figure 4.18 Tonnages of recyclable solid waste**




**Question E6 - Recyclable material that grew the most over time.**

The entrepreneurs gave the following diverse views in terms of this question:

- Plastic – because more plastic is produced in Johannesburg and the margins on plastic have increased. The increase in the margins on plastics has provided an incentive for the public to collect plastic and sell it to the solid waste buy-back centres.
- Glass – due to the economic boom experienced in the country over the last few years, people have produced more recyclable waste material and glass has been the most recyclable waste material that has grown.
- Paper – because of strategic partnerships that were formed with offices producing waste paper. The offices generating recyclable waste paper made arrangement with some buy-back centre to collect their waste paper.

#### *4.3.3.6.1 Summary of the Market and Profitability Analysis*

The above responses indicate that solid waste buy-back centres that produce more than 40 tons of solid waste recyclable per month are more profitable and have a monthly net-profit of more than R30 000,00. The solid waste buy-back centres that receive more than 40 tons of recyclable material contribute to employment as they employ more than 10 people.

The factors that contribute to increased solid waste recycling are increase on margins of recyclable materials, economic growth that results in more recyclable being produced and strategic partnerships with producers of recyclable waste material. The next section discusses additional information that might have been omitted in the questionnaire.

### 4.3.4 General

From the questionnaire, the following additional issues were raised in terms of the needs of the entrepreneurs operating solid waste buy-back centre to make their business more profitable:

- The need for support from the authorities in terms of technical assistance, provision of infrastructure such as containers and bigger land for the business operation, and assistance with forming strategic partnerships with generators of recyclable waste material.

- The need to be part of community clean up campaigns to raise greater awareness on waste and recycling so that the public can bring more waste to the solid waste buy-back centres.
- The need to form networks amongst entrepreneurs running solid waste buy-back centres so that there can be exchange of knowledge and information.
- The need for business skills such as marketing and financial management; and
- The need for business mentors to assist entrepreneurs to make their businesses more profitable.

The conclusions of the empirical are discussed in the next section.

## 4.4 CONCLUSION

The entrepreneurs' profile indicates that a large percentage of people who run buy-back centres are male, black and above the age of 50 years. In line with government's strategy of empowering women, blacks and the youth, the solid waste buy-back centres can be an area for government intervention.

Most of the entrepreneurs have some business skills and this means that new entrepreneurs who would like get into the recycling business would need to be provided with some business skills or a mentorship programme.

Most of the solid waste buy-back centres are located in township residential areas and the socio-economic status of those areas is low to average, which seems to suggest that land costs make it difficult to run recycling businesses in affluent areas.

In order to run a profitable solid waste recycling business, prospective entrepreneurs need to have some kind of business experience or skills. Institutional support for establishing and running the solid waste recycling business is available but not coordinated properly. It is possible to start a solid waste recycling business without any initial capital. However, some of the profits will need to be invested in the business to make it more profitable and sustainable. The entrepreneurs approaching the City of Johannesburg

council do not approach the right department, that is Environmental Management. Hence the lack of assistance with their request for more land, equipment, strategic partnership and awareness campaigns.

The lack of infrastructure and unavailability of more land of some of the solid waste buy-back centres hinder their ability to recycle more solid waste. In turn, this affects their profitability.

The more recyclable solid waste material the solid waste buy-back centres receive, the more profitable they become. The income generated from solid waste buy-back centres can sustain the business. Factors such as economic growth, availability of infrastructure (including land, business training, upstream integration with producers of waste material, and public awareness) contribute to the profitability of solid waste buy-back centres.

The last chapter of the research will discuss what conclusions can be drawn out of this study and the recommendations

# CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

## 5.1 INTRODUCTION

The literature study and empirical study have provided greater insight into the primary and secondary objectives of this research. The conclusion to this research is discussed in the next section, with recommendations which shall conclude the research.

## 5.2 SUMMARY OF FINDINGS

The findings of the primary objective and the secondary objectives are discussed in this section. The primary objective is as follows:

*To establish the viability of establishing solid waste buy-back centres*

(i) The findings of the primary objective of the study provides the following conclusions with regard to factors that support the primary objective:

a) The viability of establishing a solid waste buy-back centre is dependent on a number of factors; chief amongst them is the quantity of recyclable solid waste that is received by the buy-back centre. Amongst the solid buy-back centres that were sampled, the least profitable buy-back centre with a monthly profit of less than R5 000 received less than 20 tons of recyclable solid waste per month. The most profitable solid waste buy-back centres with a monthly income of more than R30 000 received more than 40 tons of recyclable solid waste per month. These factors lead to the conclusion that a solid waste buy-back is an economy of scale business. In other words, the more recyclable solid waste is received by the buy-back centre, the more profitable the buy-back centre becomes.

According to the SOER (2003:69), 50% of the solid waste generated in the City of Johannesburg is recyclable, while only 10% is recycled. There is an opportunity for solid waste buy-back centres to capture at least 40% of the recyclable solid waste that is being dumped at the landfill site. The 40% recyclable waste could be as much as 320 000 tons annually (1, 6 million

tons generated annually X 50% recyclable waste = 800 000 tons annually X 40% non-recycled, recyclable solid waste = 320 000 tons). The fact that 40% recyclable waste is not recycled, presents an opportunity for entrepreneurs to establish or grow their solid waste buy-back centre business (SOER, 2003:69).

b) Trends in the developed economies indicate that rapid urbanisation results in the generation of more recyclable solid waste in the form of packaging waste. The City of Johannesburg is also facing rapid urbanisation and therefore more recyclable solid waste will be generated in the City. This increased generation of recyclable solid waste indicates that there is a growing market for solid waste buy-back centres.

c) The non-recycling of recyclable solid waste material leads to environmental problems that may be avoided through solid waste recycling. The solid waste buy-back centre addresses some of these environmental problems and thus making the solid waste buy-back centre a viable business.

d) Landfill sites occupy large tracts of land. Areas such as the City of Johannesburg, which experiences an influx of foreigners and South African citizens from the rural areas, are challenged by the lack of land for disposal of waste. Solid waste buy-back centres therefore present an opportunity to address such challenges and thus making them economically viable.

e) The more recyclable solid waste received at the solid waste buy-back centres (more than 40 tons per month), the more employment is created for the community (more than 10 employees per buy-back centre).

(ii) An analysis of the primary objectives with regard to factors that limit the economic viability of establishing a solid waste buy-back centre, presents the following:

(a) The lack of co-ordinated efforts from all spheres of government, agencies involved in solid waste recycling, and the public, hinder efforts by entrepreneurs to fully exploit opportunities to establish and grow solid waste buy-back centre businesses. For example, the Department of National Environmental Affairs and Tourism's National Waste Management Strategy and Action Plans of 1999 and the City of Johannesburg's Integrated Waste Management Plan of 2005 have similar plans on paper.

Yet there are no formal institutional arrangements between the two departments to oversee the implementations of these plans.

(b) Most of the entrepreneurs (62%) that seek assistance to establish or grow their solid waste buy-back centres, have approached the wrong departments in the City of Johannesburg. This is the result of improper dissemination of information from the City of Johannesburg in terms of the type of assistance to be rendered and by which department. Assistance from the City of Johannesburg to the solid waste buy-back centre entrepreneurs can assist in developing the establishment of a solid waste buy-back centre into a viable business.

(c) The entrepreneurs running solid waste buy-back centres indicated that public education can assist them with receiving more quantities of recyclable solid waste material, instead of waste being dumped at landfill sites. Studies in the developed economies have revealed that the more the public is informed about the benefits of recycling, the more recyclable solid waste gets recycled. The lack of further public education on the benefits of solid waste recycling hinders the optimal recycling of solid waste and in turn the economic viability of the solid waste buy-back centres.

(d) Legislation and enforcement in the developed economies play a critical role in promoting and compelling the public and industries to undertake solid waste recycling. The analysis of legislation in South Africa and in particular the City of Johannesburg shows that legislation promotes recycling but does not force the public and industries to undertake recycling. Therefore, optimal rates of recycling are not realised which could benefit the solid waste buy-back centres.

(e) The lack of skills (especially financial, economic and marketing skills) from most of the entrepreneurs who run solid waste buy-back centres, compromises their ability to make their business more effective and thus, more profitable. The entrepreneurs interviewed did not state any intended proactive measures, such as getting new markets to bring recyclable solid waste to the buy-back centres or re-investing some of their profits into the business to get the necessary infrastructure to increase the profitability of their operations.

The conclusion drawn is that to establish solid waste buy-back centres within the City of Johannesburg is economically viable and that there are growth

opportunities for these businesses, provided that some challenges and policy interventions stated under 5.3 and 5.4 are addressed. These challenges and policy interventions will be discussed under implications for management and recommendations.

The secondary objectives of the research are stated and discussed next:

*5.1.1 To investigate whether there are incentives for government and entrepreneurs to establish a solid waste buy-back centres in the City*

An analysis of the above objective indicates the following:

a) There are incentives for establishing solid waste buy-back centres in the City of Johannesburg for an example the study indicates that there is net-profit of R5 000 to more than R30 000 that can be realised by entrepreneurs from the business.
b) Solid waste recycling saves on waste disposal costs for the City of Johannesburg.
c) Solid waste recycling business generates employment and income for the communities.

*5.1.2 To investigate the economic disincentives for establishing a solid waste buy-back centre business in the City*

An analysis of the above objective indicates the following:

a) The biggest handicap for establishing a solid waste buy-back that is operating optimally is the high amount of start-up capital required, which can be as high as R1, 5 million. However, it is possible to start the business on a small scale and develop it by re-investing some of the profits into the business
b) The sales margins on the recyclable solid waste material are volatile and depend on the economics of supply and demand by the industries using recyclable solid waste material. The low margins can act as an economic disincentive for entrepreneurs to establish a solid waste buy-back centre business.

*5.1.3 To identify the gaps that can hinder solid waste recycling being a viable business*

An analysis of the above objective indicates the following:

a) Lack of readily available information to potential and some existing entrepreneurs on the institutional support that is available to establish and or grow the solid waste buy-back centre is a gap. Most of the entrepreneurs that have approached the City of Johannesburg, have approached the wrong department, in spite of the fact that the environmental department of the City of Johannesburg has made budget allocations of R3,3 million for the 2008/09 financial year to assist in the establishment and upgrading of the solid waste buy-back centres.
b) Lack of co-ordination in the implementation of the solid waste recycling programmes by all spheres of government can result in programmes that promote the viability of establishing solid waste buy-back being compromised. For example, the annual prioritisation of recycling programmes is not shared between the spheres of government. This results in the synergies not being fully exploited.

*5.1.4 To provide recommendations on support structures and mechanisms required to establish a viable solid waste recycling business*

The above objective will be discussed under recommendations in section 5.3 under recommendations

*5.1.5 To identify potential policy interventions for the City to adopt in order to encourage the solid waste recycling business*

The above objective will be discussed in the next section.

## 5.3 SOME IMPLICATIONS FOR MANAGEMENT

Based on the research conducted on the economic viability for establishing a solid waste buy-back centre, the following have been identified as implications for the management of the City of Johannesburg:

a) Solid waste buy-back centres contribute to the goals of the City of Johannesburg by promoting a safe and green city in terms of protecting the environment, creating employment opportunities and promoting entrepreneurship amongst the previously disadvantaged groups of the communities (blacks, women and the youth). The City of Johannesburg will need to design legislation and programmes that promote optimal recycling (the recycling of 50-60% of solid waste generated in the City of Johannesburg) to fully exploit the opportunities that are brought about by solid waste recycling business.
b) Management will need to revise the Integrated Waste Management Plan of 2005 for the City of Johannesburg to ensure that all programmes and targets are still on track. The City of Johannesburg will need to use the projects in the Integrated Waste Management of 2005 as the basis of planning for the five year IDP strategic objectives, the service delivery agenda collaboration with other stakeholders.
c) There is a need for the City of Johannesburg to develop a forum with national government, provincial government and the private sector to discuss waste programmes and the alignment thereof.
d) Management will need to look at international legislation and programmes that promote solid waste recycling and adapt some of them where applicable for the City of Johannesburg's situation through legislation, policies and programmes.

   The international legislation and programmes that management will need to look are for an example the producer responsibility notes in the United Kingdom which require everybody in the value chain of recyclable waste (from manufacturer of packaging waste to the seller) to recover a certain percentage of recyclable waste from the packaging waste they handle.
e) The City of Johannesburg will need to conduct road shows on how the City can assist current and potential entrepreneurs on establishing and growing a solid waste buy-back centre business.
f) The empirical study has indicated that 76% of the solid waste buy-back centres are located in areas with low to average socio-economic status. The City of Johannesburg will need to also make land in affluent areas available for operating buy-back centres, as the study has indicated that most of the recyclable waste generated in high income areas and are in the form of packaging waste.

g) The majority of entrepreneurs who operate the solid waste buy-back centres are black males. In line with government's strategy for empowering women, the City of Johannesburg will need to give preference to potential women entrepreneurs.

## 5.4 RECOMMENDATIONS

The following are general recommendations emanating from the study on the economic viability of establishing a solid waste buy-back centre in the City of Johannesburg:

a) National, provincial and local government should revise legislation on solid waste recycling so that optimal recycling is encouraged.
b) Efforts should be co-ordinated by government, recycling agencies, industrial recyclers, and entrepreneurs operating solid waste buy-back centres, and the public in order to fully exploit the synergies in the efforts of all the role-players involved in solid waste recycling.
c) Opportunities for public and private partnerships should be explored as there are some mutual benefits that can be derived from such arrangements, such as government providing capital infrastructure to entrepreneurs and in then in turn specifying performance standards that should be met.
d) All spheres of government should undertake road-shows and massive education and awareness campaigns in order to educate the public about solid waste recycling and the benefits thereof. There should be broad education especially targeted to children and the youth as they are normally considered agents of changes in the communities.
e) Specific training courses, including finances, economics and marketing for entrepreneurs that operate or intend to operate a solid waste buy-back centre business, should be designed.
f) Set targets about the number of solid waste buy-back centres that need to be established in every region of the City of Johannesburg.
g) Future research should be conducted on the following topics:

    - Expand the survey undertaken in this study on a national level.

- Mechanisms for assisting potential entrepreneurs to establish solid waste buy-back centres that operate optimally (receive and sell more than 40 tons of recyclable solid waste material per month).
- Identification of measures to capture the 40% of solid waste that is not being recycled.

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# APPENDIX

Appendix 1: **Questionnaire on the viability of establishing solid waste buy-back centres**

# QUESTIONNAIRE ON THE

# VIABILITY OF ESTABLISHING

# SOLID WASTE BUY-BACK CENTRES

This questionnaire is anonymous and as such will be treated confidentially. The purpose of the questionnaire is to get data and profile the successes and the challenges in the waste recycling business. Please mark your answer with an X.

For an example:

Are you running a waste recycling business?

| Yes | X | No | |
|---|---|---|---|

**A. Entrepreneur profile**

1. Gender of the entrepreneur

| Male | | Female | |
|---|---|---|---|

2. Race

| Black | | White | |
|---|---|---|---|

3. Age

| 20 - 26 | | 27 - 34 | | 35 - 40 | | 41 - 49 | | 50+ | |
|---|---|---|---|---|---|---|---|---|---|

4. How long have you been in business

| Less than 5 years | | Between 5 – 10 years | | More than 10 years | |
|---|---|---|---|---|---|

5. Educational level

| Not matriculated | | Matric only | | Technikon / University degree | |
|---|---|---|---|---|---|
| Short course certificate in business | | Management programme | | Other | |

If other please specify.....

6. Any other business experience?

| Yes | | No | |
|---|---|---|---|

## B. Geographic Profile

1. Area business is located

| CBD | | Residential – urban | | Residential – township | | Other | |
|---|---|---|---|---|---|---|---|

If other please specify.....

2. Average socio-economic status of households in the area?

| Low | | Average | | High | | Don't know | |
|---|---|---|---|---|---|---|---|

3. Type of company

| CC | | Family/Sole ownership | | Community company | | Other | |
|---|---|---|---|---|---|---|---|

If other please specify.....

## C. Institutional support mechanism

1. Any business skills that you were provided with or receiving?

| Yes | | No | |
|---|---|---|---|

If yes, what are they.....

.....

.....

.

2. Have you approached any place / anybody with help to start the business

| Yes | | No | |
|---|---|---|---|

If yes, who .....

Were you successful?.....

3. Have you been successful in securing the funds to start your business?

| Yes | | No | |
|---|---|---|---|

If no, why not?.....

.....

4. Have you approached the Council /City for help to start the business

| Yes | | No | |
|---|---|---|---|

If yes, which department.....

5. Any other support that you feel can help grow your business to be more profitable?

.....

## D. Infrastructure analysis

1. Are you formally occupying land where you are conducting the business or is it an informal arrangement

| Yes | | No | | Renting | |
|---|---|---|---|---|---|

2. **Equipment available on site**

| | Yes | No |
|---|---|---|
| Structure (Offices, storage, toilets | | |
| Fencing | | |
| Paving | | |
| Electronic scale | | |
| Bailing machine | | |
| Crusher | | |
| Office equipment | | |
| Vehicle/s | | |
| Available cash for waste purchasing | | |
| Salaries for first six months | | |

| | | |
|---|---|---|
| Palletizer | | |
| Computer | | |
| Skips/ drums/ bags | | |
| *Other, | | |
| *Other | | |

## E. Market and profitability analysis

1. What are your average costs per month (R)?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| < 5000 | | 5000 > < 10000 | | 10000 > <15000 | | > 15000 | |

2. What is your average monthly net-profitr (R)?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| < 10000 | | 10000 > < 20000 | | 20000 > <30000 | | > 30000 | |

3. How many staff employed in your business?

| | | | | | |
|---|---|---|---|---|---|
| < 5 | | 5> < 10 | | > 10 | |

4. What key partnerships do you have with sellers and buyers of recyclables for example community groups, shopping centres, schools, etc

.....

.....

5. AvFerage quantities of type of recyclable waste received per month

| Type | Quantity/kg | Per day or per month | | Buying price | Selling price | Total difference |
|---|---|---|---|---|---|---|
| Paper | | | | | | |
| Cardbox | | | | | | |
| Plastic | | | | | | |
| Glass | | | | | | |
| Tin | | | | | | |

6. Over time, what is the trend and which grew most and why?

.....

.....

## F. General

Any other info you willing to share

.....

Thank you for your assistance

Malcolm Mogotsi