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# Solid waste management.

Final Report



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## **Abstract**

This study was done to aid the production of a State of the Environment Report for Grahamstown, with the focus being on solid waste management. Samples were taken from various households, businesses, Rhode University residences, recycling centres and the municipality. The study on solid waste management in Grahamstown revealed that waste management is a major problem even in this city. A lot of the waste generated by different sectors in the city is taken to the landfill site. This is inclusive of rubble and garden waste. Majority of the households in the town make use of the municipal waste disposal service. It appears that most of the recycling projects in Grahamstown are making a difference, especially the Masihlule project, which has staff employed at the landfill to sort the waste. Many household residents do not recycle because they do not know where recycling centres are and because the two-bag system has not yet been introduced in the city, a lot of people do not recycle the waste themselves. A lot of what is happening in terms of waste management is influenced by socio-economic factors such as education and income levels. Household survey results indicate that people residing in the West of Grahamstown participated more in recycling than those living in the East. Residents in the East said they would be more encouraged to recycle if there were financial incentives offered for doing this. In terms of illegal dumping, residents in the East seem to be affected more by the dumping of waste than residents in the West. The municipality has put in place strategies to help alleviate the situation. People's recycling attitudes seem to depend on the importance that they place on the environment and environmental education is seen as the key tool that can be used to encourage people to recycle. The municipality, therefore, needs to put more emphasis on environmental education and invest more on environmental projects as a means to improve waste management in the city.

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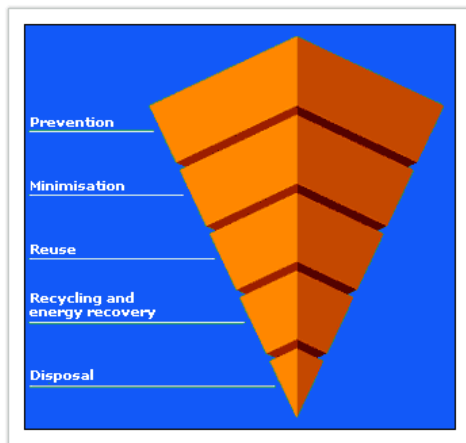
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## **Introduction**

Waste can be viewed as a manifestation of the inefficient use of resources or the root cause of pollution and associated environmental degradation. Whichever way it is perceived, increased waste generation is an inevitable consequence of development and needs to be systematically managed in order to conserve resources and protect the environment (DEAT, 2001: 1). Since the industrial revolution, development has been at the fore-front of political agendas, however over the past 20 years; pollution has been recognised as a main driver of environmental degradation and has been paid a lot more attention internationally. This has been evident in the many international protocols and conventions that have arisen, including the World Commission on Environment and Development in 1983 and the United Nations Conference on Environment and Development which took place in Rio de Janeiro in 1992, where 178 countries agreed to Agenda 21 as a blueprint for sustainable development (DEAT, 2000: 1).

On a national level, the White Paper on Integrated Pollution and Waste Management (IP&WM) is part of the South African government's efforts to meet the goals of Agenda 21. It recognises that our country has emerged from a period of unsustainable and inequitable development which has caused environmental degradation (DEAT, 2000: 1). The National Waste Management Strategy is a follow up document to the White Paper on IP&WM, which identified waste generation and waste reduction as two main issues to tackle. Its objective was to reduce generation and environmental impact of all forms of waste, so that the socio-economic development of South Africa, the health of its people, and the quality of its environmental resources would no longer be adversely affected by uncontrolled and uncoordinated waste management (DEAT, 2011: 1).

The National Environmental Management: Waste Act (Act 59 of 2008) of South Africa adopts a hierarchical classification which requires firstly that the generation of waste is reduced, waste that cannot be reused or recycled should be treated or the energy should be recovered before land filling. The landfill option is the least favoured option in this hierarchy (South African Waste Information Centre, 2010: 1). Figure 1 below depicts this scheme.



**Figure 1:** Solid waste management hierarchy (South African Waste Information Centre, 2010: 1).

For the purpose of our project, we will be using the definition for waste as set out by the NEM: WA, solid waste is “any substance, whether or not that substance can be reduced, reused or recycled and recovered:

- that is surplus, unwanted, rejected, discarded, abandoned and disposed of,
- which the generator has no further use of, for the purpose of production,
- that must be treated or disposed of, or
- that is identified as waste by the Minister by notice in the Gazette and includes waste generated by the mining, medical or other sector.” (Act 59 of 2008)

Locally, the Eastern Cape conducted a State of the Environment Report in 2004, which identified the problem with waste management in different municipalities, as well as other indicators of environmental degradation. The problem of waste disposal methods and lack of recycling was a main focus (CSIR, 2004: 1). Improper solid waste disposal increases the risk of health effects, such as cholera, causes damage to ecosystems and accelerates the destruction of the environment (Hamer, 2003: 73). After this report, Makana Municipality conducted research into environmental issues within our municipal area in 2004/2005 and produced a Local Environmental Action Plan (LEAP). This implementation plan was primarily aimed at addressing illegal dumping and preventing waste materials from entering rivers and streams. It recognised that this could only be achieved through a wide variety of interventions including public participation, by-laws, changes to collection systems and

awareness campaigns (Makana Municipality, 2005: 3). The plan also focused on recycling, due to its potential to reduce the refuse load and to lengthen the lifespan of landfill sites.

Our project requires us to follow up on these local findings through a State of the Environment Report of Grahamstown's solid waste management and recycling. A State of the Environment Report (SoER) is a tool that is used globally to integrate and communicate information on the environment. Effective policies and decisions require reliable information, so the main aim of the SoER is to aid the decision makers by providing current scientific data in a user friendly and appropriate format (Will, 2006: 2). Although there is little evidence to prove the SoERs have been used by decision makers, it is evident that they have made some progress towards highlighting the importance of understanding environmental issues and using them to create new policies and implementation plans (Will, 2006: 2).

Many State of the Environment Reporting uses the DPSIR framework, which distinguishes drivers, pressures, states, impacts and responses (Kristensen, 2004: 1). According to this framework, there is a chain of causal links starting with 'driving forces of environmental change' through 'pressures on the environment' to 'state of the environment and trends' and 'impacts on the environment' eventually leading to 'political responses' (Kristensen, 2004: 1). Our specialist study focuses on waste management and recycling of which we have identified waste as a pressure on the environment, but we will turn more towards the state that Grahamstown is in, and responses of different entities within the town. It is, after all, the people that can make a difference and create a more efficient, manageable waste system which will help stop the degradation of our environment.

## **Objectives**

The main aim of the project is to analyse the state of the environment in Grahamstown focusing on solid waste management and recycling of domestic materials which excludes hazardous waste. This is important for increasing stakeholder awareness and understanding of the state of the environment, improving the likelihood of informed decisions regarding solid waste, and measuring progress towards sustainable development (Gambiza, 2011: 1). We will attempt to bridge the three dimensions of environmental systems (environmental, social and economic) so as to suggest feasible, socially acceptable and environmentally friendly solutions to any downfalls that may be evident.

## **Key Questions**

The key questions addressed in the study were taken from the Department of Environmental Affairs and Tourism's guidelines for State of the Environment Reporting (Gambiza, 2011: 1).

### What is happening in the environment?

- What happens to household and commercial waste in Grahamstown?
- Are the recycling projects initiated in Grahamstown making a difference?

### Why is it happening?

- How do social and economic factors (e.g. education, income, location) influence people's attitudes towards domestic waste disposal?

### What will happen if we do not act now?

- What is the effect of illegal dumping sites on surrounding households?

### What are the opportunities and constraints? What are, or can we do about it?

- What are people's attitudes towards waste? (Attitudes)
- What are the barriers to having an effective waste management system? (Limitations)
- How can municipality intervene to facilitate household participation in proper domestic waste management? (Recommendations)

## **Study Area**

The study area is focused on Grahamstown which is situated in the Eastern Cape of South Africa (Figure 2). Grahamstown is situated at 33° 18' 26.9'' S, 26° 31' 10.3'' E, it is located in a valley that cuts into a plateau at an altitude of 500m (Amutenya *et al.*, 2008: 2). Grahamstown is located in the Makana Municipality and it has a moderate climate with annual average temperatures ranging from 9 to 23 °C (Grahamstown Handbook, 2011: 1). Makana Municipality is a semi-arid area that lies in a subtropical climatic zone where it is characterised by warm summers and cool winters. The rainfall in Grahamstown falls

throughout the year with the mean precipitation averaging 680mm (Makana Municipality, 2010: 70). The town's hottest and wettest months are December to March and its coldest months are June to August (Grahamstown Handbook, 2011: 1). The prevailing wind direction in Grahamstown is from the west and southwest (Makana Municipality, 2011: 70). Due to the city's variable climate, Grahamstown has diverse flora with four biomes bordering the city. These include the Cape fynbos, Karoo, Grasslands and Subtropical thicket (Grahamstown Handbook, 7).

Grahamstown is mainly a legal and educational service centre where IsiXhosa is the widely spoken language (McCarthy, 2010: 1). It makes the largest contribution of Gross Domestic Product (GDP) to the Makana Municipality, mostly in the form of tourism and educational services, which contributes 1.51 percent to the GDP of Eastern Cape (Makana Municipality, 2010; 32). Features of influence include a wide variety of religious and educational institutions, Rhodes University which employs 10 percent of the entire Makana labour force, the Grahamstown High Court, historical attractions and the Grahamstown Festival which is the largest arts festival in Africa (Grahamstown Handbook, 2011: 1). The majority of the Grahamstown residents are working class between the ages of 15-34 with females forming the majority of the population. The population of the town is 120 000 with 70 percent of the population being unemployed (Strodl, 2010: 1). The unemployment levels in this area are much higher than at a district level showing that there is a lack of employment opportunities within this region (Makana Municipality, 2010: 34).



**Figure 2:** Street view of Grahamstown in South Africa (Modified from Google, 2011: 1).

## Methods

### **Data collection**

Our sample was divided up between:

- Rhodes University
- Households
- Commercial
- Recycling centres
- Municipality
- Local newspaper articles.

Within the areas of study, Rhodes University was divided into six residences (25 students from each) and an interview with Mark Hazell- Head of Grounds and Gardens. Household samples were taken from the high density region in the East and the low density region in the West of the city. In 2007, Grahamstown was estimated to have approximately 11 000

households (Shackleton *et al.*, 2007). A sample size of 120 households was chosen, which is approximately one percent of the total number of households in Grahamstown, bearing in mind a possible increase in the total number of households since 2007. Commercial entities consisted of 30 businesses in and around town covering an array of business types (i.e. food, office and retail), and recycling centres included all the recycling centres in Grahamstown. In terms of the municipality, we conducted interviews with the Environmental Manager and the Manager of Environment and Cleansing. We also consulted with Grocott's Mail to find out what was happening locally.

Quantitative and qualitative research methods were used in the study. Quantitative research can be defined as “the collection and analysis of data in numeric form” and qualitative research is said to involve “the use of non-numeric data to describe and generate an understanding about a given phenomenon” (Kamara, 2006: 8). The research for the study was mostly quantitative, however, as most of the data was collected through interviews and questionnaires. The household research plan used in this study was similar to that of Davenport *et al.* (2011: 1455) as we first did a pilot run of the questionnaires on ten different households to test their feasibility. The questionnaire included both open-ended and closed questions and they were given to heads of households to fill in. In households where English was not well spoken, the questionnaire was translated.

For the local municipality, Rhodes University campus, recycling centres and areas of business we conducted open-ended interviews. These were constructed in a similar way to the questionnaire but were laid out in such a way that they were more specific to the particular area of interest. Interviews and questionnaires captured information such as perceptions on solid waste management and recycling and levels of participation in terms of recycling and adequate waste management. We investigated the different types of waste generated from the sample areas as well as the average amount of waste the different areas generated.

### **Assumptions**

The underlying assumptions for this project are as follows:

- It was assumed that during the course of the home surveys all respondents would be home.

- It was assumed that everyone would be willing and honest in answering the questions.
- It was assumed that the municipality as well as key stakeholders would be available and willing to be interviewed.

### **Pitfalls**

Our questionnaires had a lot of open ended questions which could give a variety of answers, which would make comparisons difficult. The possibility of underestimating the time it would take to conduct the questionnaires would influence our deadlines for each section. Many people answer questions even if they do not understand what is being asked- this could be due to ignorance or misunderstanding. The language barrier was a pitfall we were faced with, as many respondents did not know how to answer the questions in English. Some people did not have adequate time to answer our questions properly, and others were not at home. Gaining access to the Municipal officials was difficult, resulting in a lack of variety of municipal information.

### **Results**

#### **Rhodes University**

Grahamstown has been a centre of education and the arts since the early 1900's, so to adequately assess waste management in the district, attention needs to be paid to Rhodes University and other academic institutions. Specific schools interviewed requested that their information be excluded from this report.

#### *Residences*

Results showed from the 150 students surveyed in residences at Rhodes University that 70 percent of the students recycled and an extra 14 percent responded that if there were a drive, they would recycle. Recyclable materials include: tin/cans, glass, paper/cardboard and plastic/plastic bottles. The range of materials recycled by students varies from 0 to all 4 of the items. There were 198 records of recycled material between 150 students living in residence with paper/recycling accounting for 44 percent of the material and plastic accounting for 31 percent of the material recycled. The results also show that 41 percent of the students

interviewed show that their family households recycle. Almost all students (97 percent) agreed that recycling makes a difference to the world we live in.

When students were asked about laws regarding solid waste management and recycling, 78 percent of the respondents did not know of such laws. When asked about the implications of improper waste disposal and dumping, students stated that it causes harm to animals through choking and poisoning, it destroys the environment through destruction of the natural environment and the ozone layer, it causes pollution of the water resource and the environment, and has negative impacts on agriculture through poisoning the soil. With regards to humans, students stated that littering and dumping causes infections, sickness, diarrhoea, cholera, airborne disease, malaria, breathing problems, cuts from broken glass and pollution in the air causing problems with eyesight.

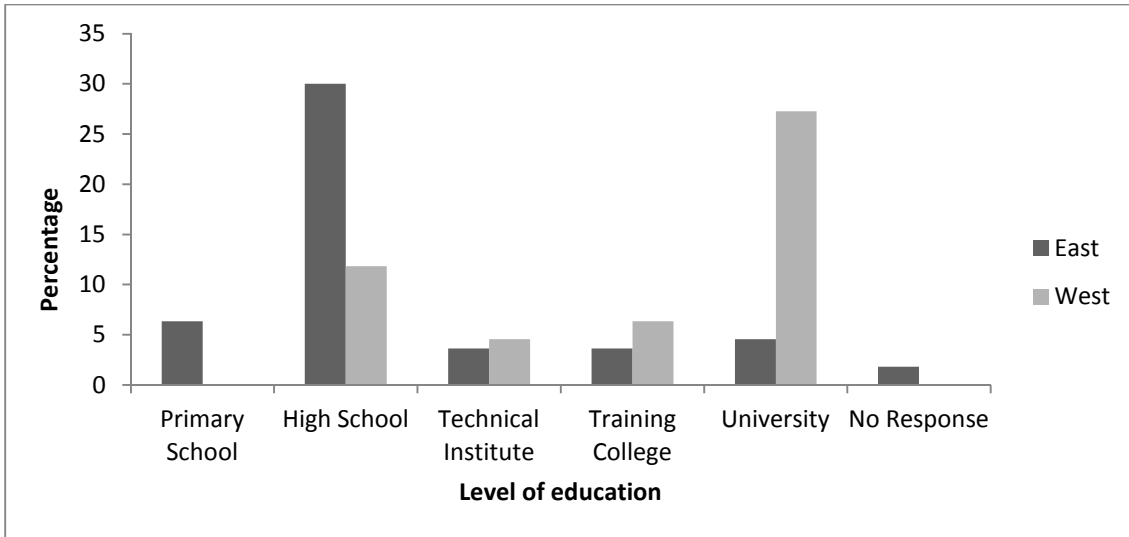
#### *Department of Grounds and Gardens*

This interview contained general, open-ended questions so as to obtain as much information from Mark Hazell – Head of Grounds and Gardens, Rhodes University - as possible. He reported on what happens with waste on campus, who on campus deals with waste management and how he feels about the efficiency of Makana Municipality in dealing with issues surrounding waste. His knowledge on the matter was extremely helpful in conceptualising the movement of products and waste in the University. Results are shown in the discussion sections below.

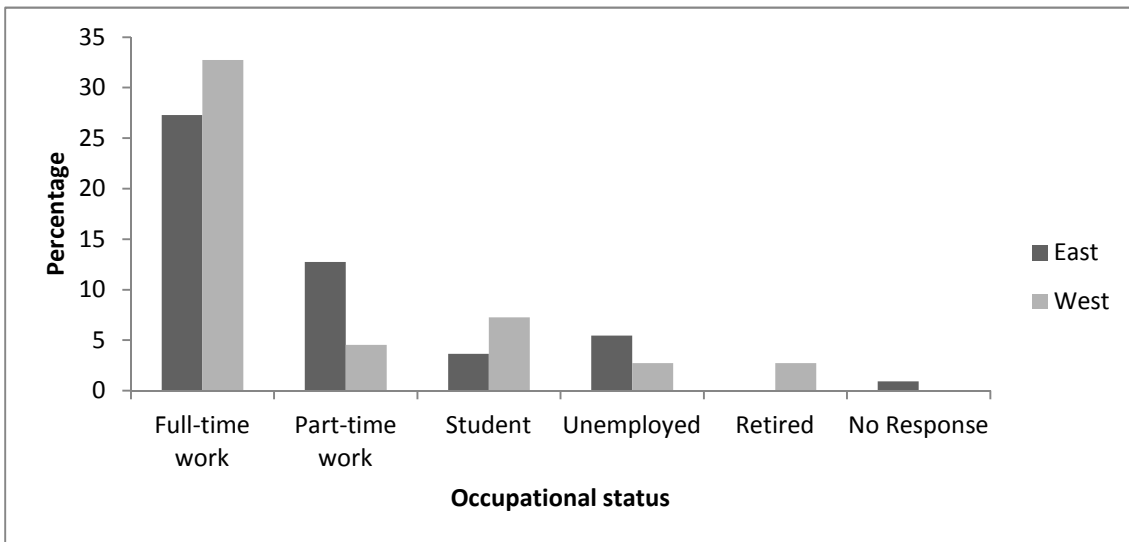
### **Households**

Most respondents interviewed had at least a primary school education, with most respondents having completed high school or university (Figure 3). When comparing the East and the West we found that most of the respondents from the East had only completed high school whereas most respondents in the West had completed university.

Most of the respondents surveyed had full-time work with only 8.18 percent of the respondents being unemployed (Figure 4). The West had a higher percentage of respondents who were employed than the East.

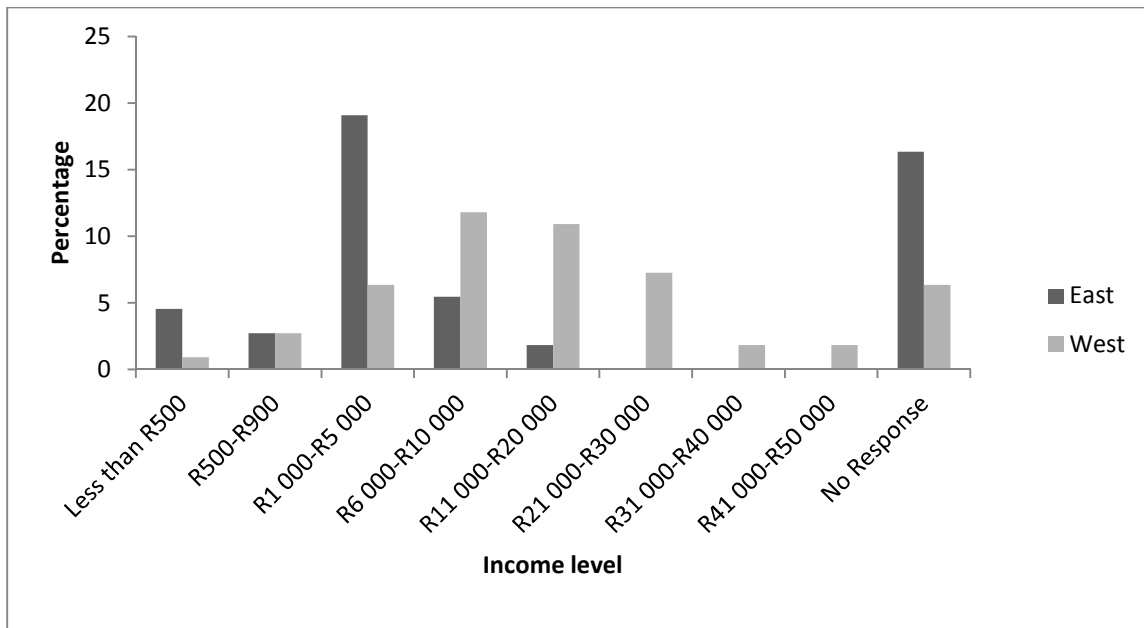


**Figure 3: Percentage number of people with different levels of education.**



**Figure 4: Percentage number of respondents by occupation.**

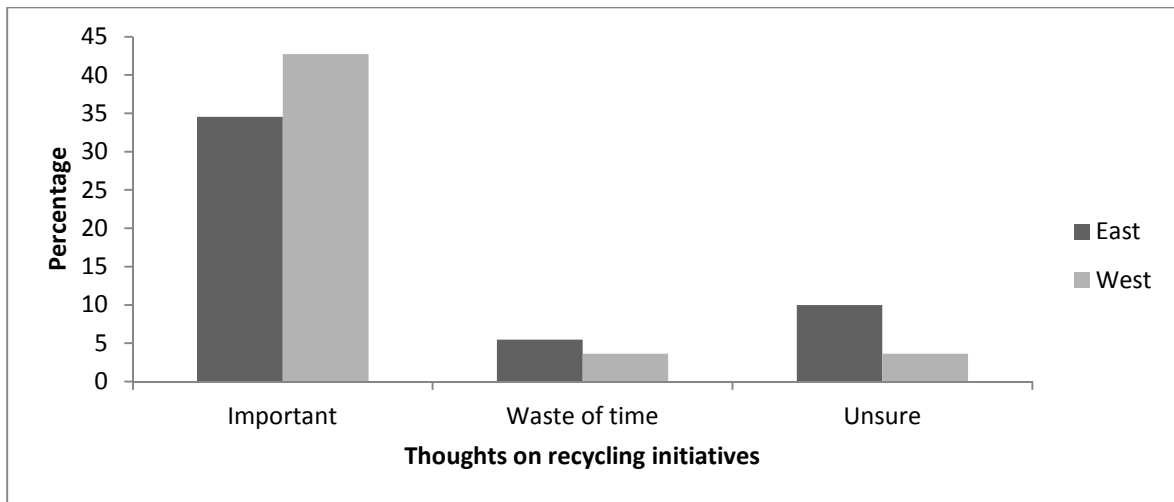
When reviewing the income level of the respondents, it was found that most of the respondents earned an income in the range of R1 000-R5 000 (Figure 5). The East sample was more skewed to the right whilst the West sample had a normal distribution. In the East, people generally earned a lower income with most respondents earning R5 000 or less. In comparison most respondents in the West earned an income of R5 000 and above.



**Figure 5:** Percentage number of respondents by income level.

Overall, we found that most of the respondents were aware of some sort of recycling initiatives taking place in Grahamstown. 51 percent and 69 percent in the East and West respectively were aware of recycling initiatives. When those aware of recycling initiatives were asked to name which they knew of, most of them mentioned the municipal recycling initiative. Other recycling initiatives commonly named include the Masihlule project and the integrated waste and recycling services project. In the East most of the recycling initiatives named include places where you could drop off glass and other materials such as scrap metal or tins, often in exchange for money. Even though the majority of the respondents knew of recycling initiatives there is still a significant proportion that is unaware of any initiatives in Grahamstown.

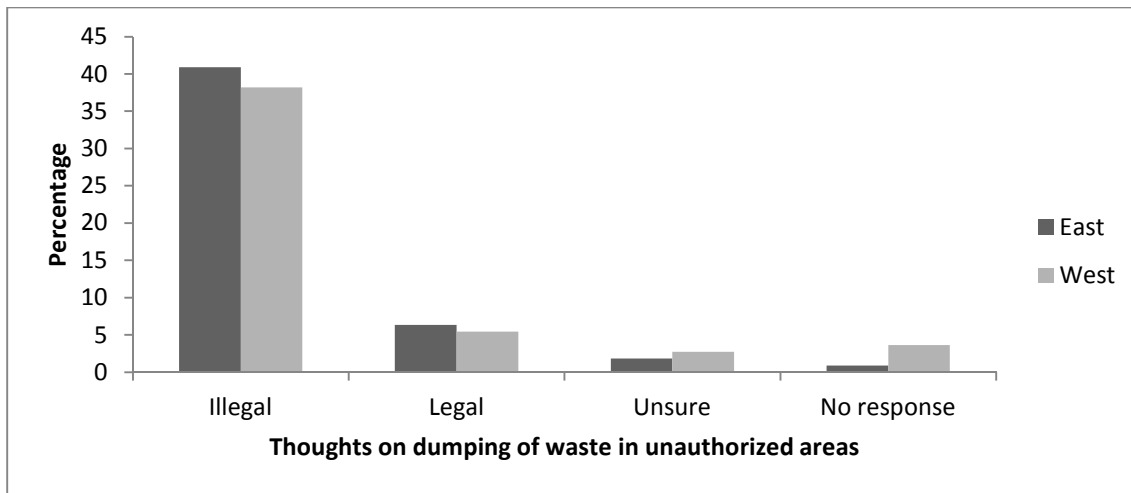
Respondents were also asked if they thought recycling initiatives were important, a waste of time or whether they were unsure about them. Most of the respondents in both the East and the West thought that recycling initiatives were important with a higher number of people in the West thinking so (Figure 6). A few respondents thought that recycling initiatives were a waste of time with a few more thinking so in the East than the West. More respondents in the East were unsure as to whether they were important or not.



**Figure 6:** Percentage number of respondents with different thoughts on recycling initiatives.

When looking at the percentage number of respondents who recycled we found that there was a greater percentage of people who recycled in the West than in the East. In the East only 29 percent of the respondents recycled whereas in the West 58 percent of the respondents recycled. Overall, in Grahamstown less than half the respondents recycled. When trying to find out if those that didn't recycle knew what recycling was, all of the respondents who did not recycle in the West knew what it was. When looking at the East, 26 percent of the respondents who did not recycle did not know what it was. Commonly stated reasons for not recycling include lack of time, lack of space to store recyclable materials, having insufficient plastics or containers to put the recyclable materials in and not knowing where recycling drop off centres were located.

When asked whether the dumping of waste in unauthorized areas was legal or illegal, the majority of respondents from both areas thought that the dumping of waste in unauthorized areas was illegal (Figure 7). There was however a small number of people from both areas that thought that the dumping of waste is a legal activity. Overall there were less than five percent of respondents from each area who were unsure.



**Figure 7:** Percentage number of respondents with varying thoughts on the dumping of waste in unauthorized areas.

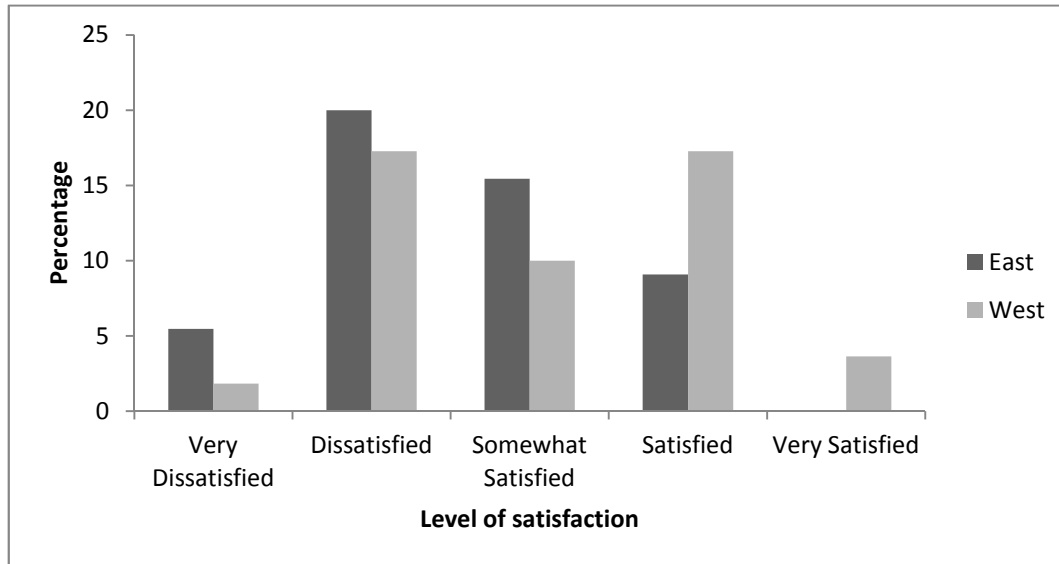
When the respondents were asked if they were impacted in any way by the dumping of waste in unauthorized areas, in the East 36 percent said they were impacted compared to 38 percent of people who said they were impacted in the West. Overall the majority of the respondents claimed they were not impacted by the dumping of solid waste in unauthorized areas in any way. Those impacted were found to be people who lived in areas close to illegal dumpsites.

A survey of the knowledge of any rules and regulations or laws surrounding solid waste management issues such as recycling, the removal of waste or the illegal dumping of waste was done. In the East, majority of people did not know of any laws concerning the three factors. In the West, more people knew about dumping and waste removal laws and regulations but fewer people knew about any laws concerning recycling. Overall we found that there was a lack of knowledge among the respondents about any rules and regulations or laws surrounding these areas of solid waste management.

Respondents were also asked if they thought the municipality does enough to inform them on issues around solid waste management. In the West, 89 percent of the people felt that the municipality was not doing enough and a similar trend was observed in the East, with 73 percent of the people saying the municipality doesn't do enough.

Another question that was asked was how satisfied the respondents were with the municipal waste disposal service. In the East most of the respondents were dissatisfied with the service (Figure 8). In the West however, there was an equal number of respondents who were

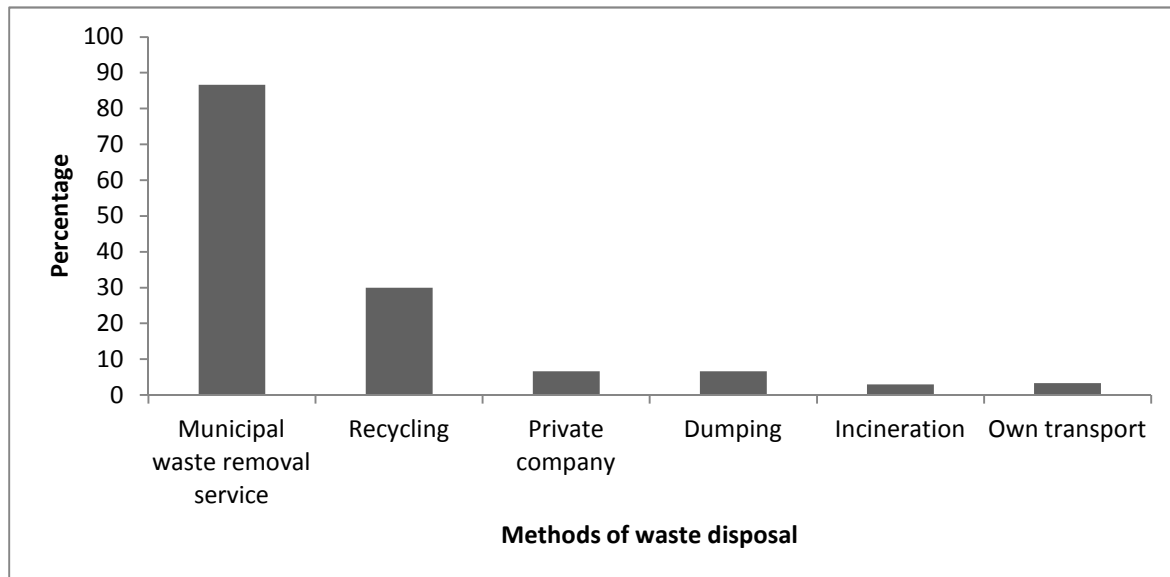
satisfied and dissatisfied with the service. Overall most of the respondents were dissatisfied with the municipal waste disposal service. Commonly cited problems with the municipal waste disposal service include lack of professionalism with the waste disposal workers, the waste disposal vehicle doesn't come at a consistent time and the waste disposal vehicle was often said to leave behind a huge mess.



**Figure 8:** Percentage of respondents with varying levels of satisfaction with the municipal waste disposal service.

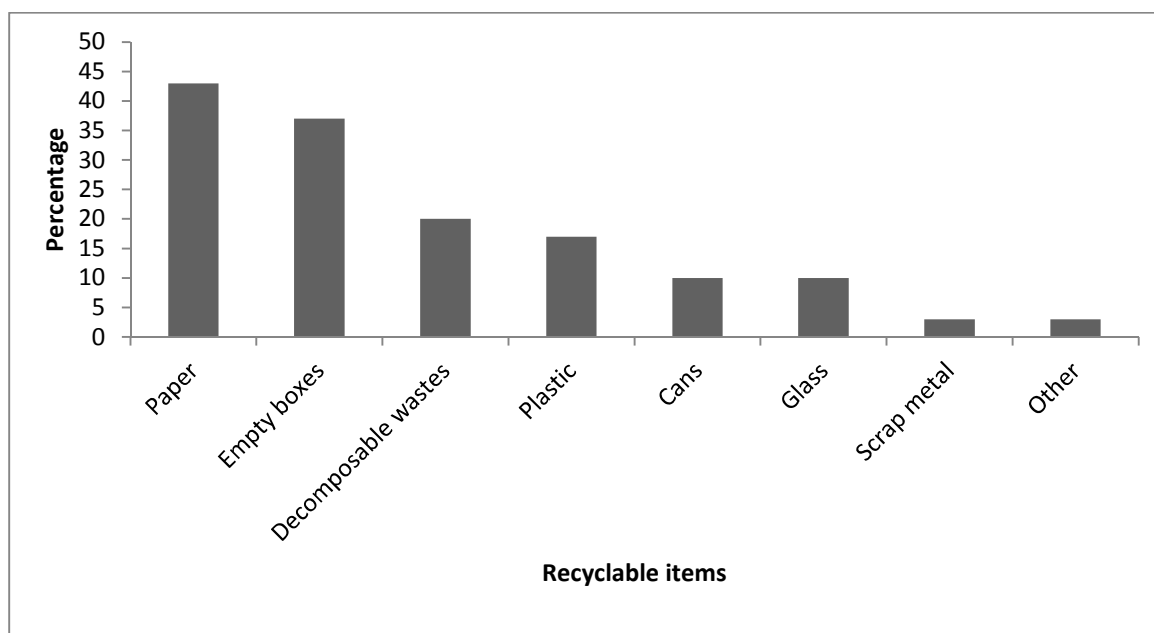
## Commercial

Figure 9 illustrates that out of the 30 businesses interviewed 86 percent mainly use the municipal waste removal service, 30 percent recycle, followed by 7 percent for dumping and private company removal and 3 percent for incineration and own transport.



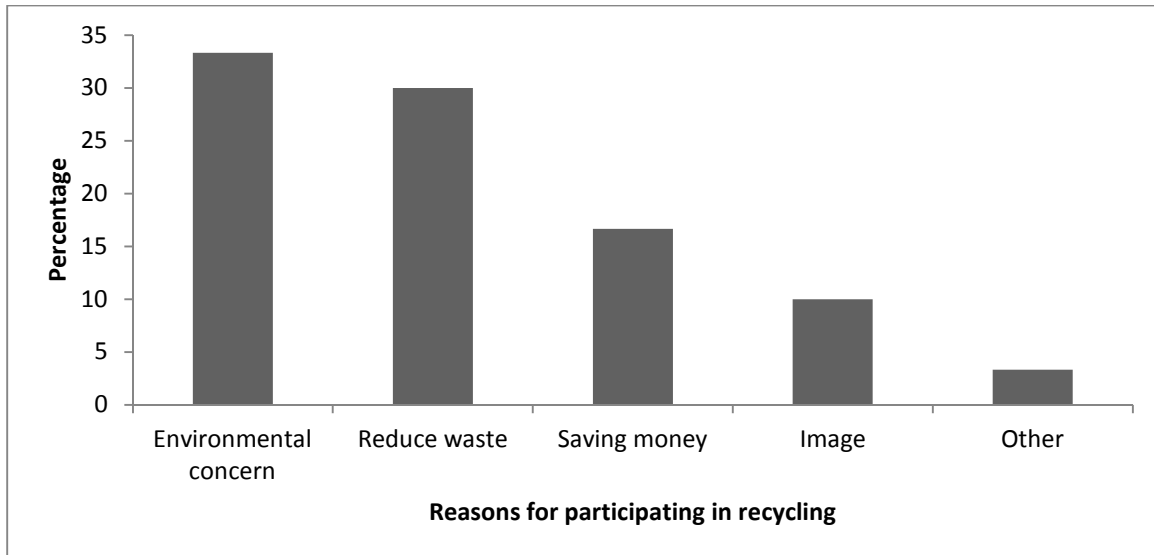
**Figure 9:** Percentage of businesses using different methods of waste disposal.

Figure 10 illustrates that the most recycled items by businesses are paper (43 percent) and empty boxes (37 percent). Other recyclable items include decomposable wastes, plastic, cans, glass, scrap metal and other items such as batteries.



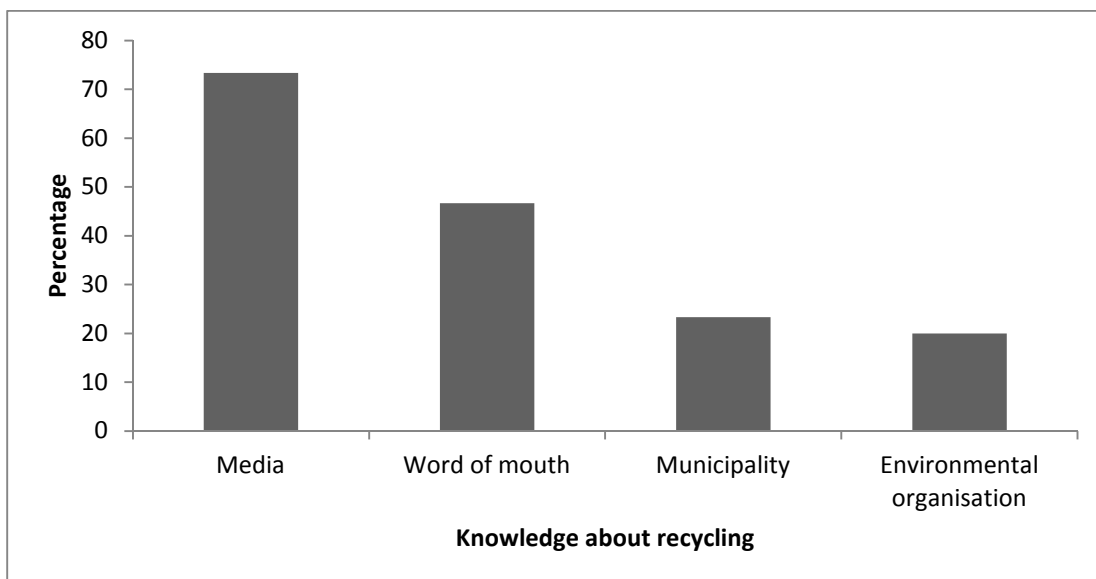
**Figure 10:** Percentages of different items recycled by businesses.

Environmental concern and reduction of waste are mainly some of the reasons most businesses get involved in recycling, followed by saving money and some recycle for image, as seen in Figure 11.



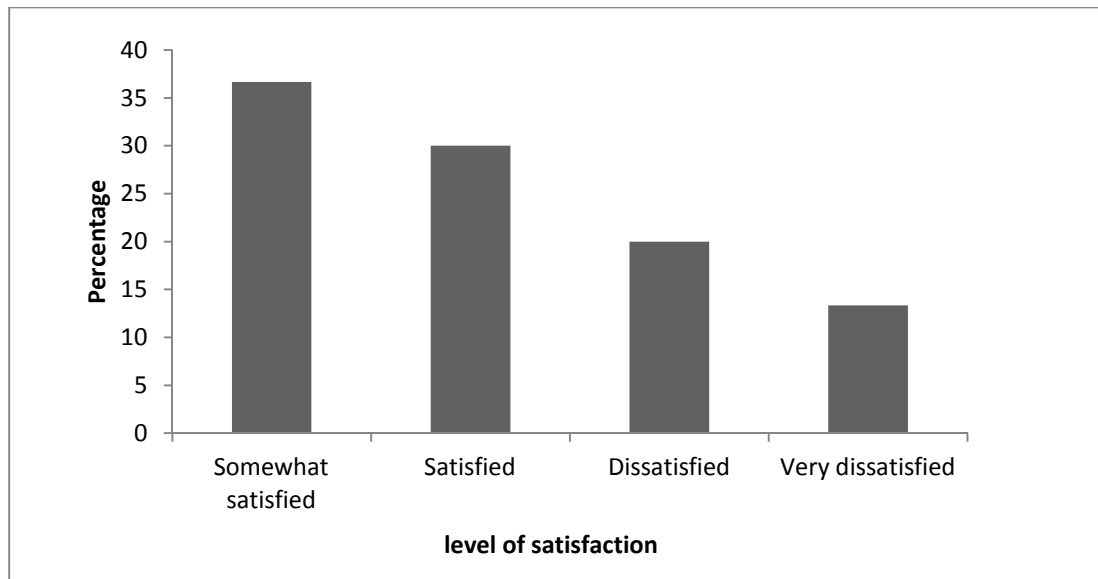
**Figure 11:** Percentages of different reasons for businesses participating in recycling.

Most business know about recycling from the media (73 percent) in the form of television, newspaper, internet, radio, etc followed by word of mouth, the municipality and environmental organisations, as seen in Figure 12.



**Figure 12:** Percentages showing how knowledge was gained about recycling.

Most of the businesses are somewhat satisfied with the municipal waste disposal services and about 35 percent of them are dissatisfied/ very dissatisfied, seen in Figure 13.



**Figure 13:** Percentages of different levels of satisfaction with municipal waste disposal service.

## **Recycling centres**

Grahamstown has a variety of recycling centres; Table 1 presents a summary of the recycling centres in Grahamstown. The table shows what is collected and what is done with items collected by all the different recycling centres. GPS points have been included in the table for ease of navigation for users to find the centres. The quantities of recyclable materials are all estimates made by employees or managers.

-The Makana Meadery is a waste free organisation. They produce more bio-fuel than what is needed and the left-over is sent to the United States of America. The business has greatly decreased its output of biodiesel due to the closure of the Ostrich industry (Cambray, 2011).

-The Masihlule Project is a relatively new business which started in 2008 and now employs 39 local residents on a full time basis at the landfill site- collecting materials to be recycled (Charles, 2011). It is an initiative of the Integrated Waste Management Plan for Makana Municipality (Funeka, 2011: 1). The project is said to be a public, private partnership between the Department of Social Development, Makana Municipality and the local recycling businesses (Adams, 2011). The rubbish is transported to the dump, where employees collect recyclable materials in big bags which are then transported to Port Elizabeth for processing. Plastic is processed on site to make poly-timber which can be used to make litter bins and benches, etc. (Charles, 2011). People are paid according to the weight of the bags that they fill (Adams, 2011). This helps reduce waste (especially plastic) thereby extending the lifespan of the landfill sites.

**Table 1: Grahamstown Recycling centres (Aneq, 2011; Boda, 2011; Bodill, 2011; Cambray, 2011; Charles, 2011; Gula, 2011; Shelle, 2011; Singh, 2011).**

Recycle centre	GPS Coordinate	Area of location	Items accepted	Obtained from	The process	Quantity recycled (per month)
<b>Makana Meadery</b>	33.31545°S 26.49571°E	Old power station (Industrial area)	Oil	Collect and receive from: Pick and Pay Wimpy Rhodes University Their own sunflower and bee making process	Feed yeast to chickens and rabbits Oil used to make biodiesel	Biodiesel: 1.5 tons With Ostrich industry 25 tons
<b>Grahamstown Recycling</b>	33.29692°S 26.4959°E	Strowan Road	Cardboard/ paper Plastic	Drive and walk by drop offs	Items compressed and sent to Durban (cardboard), King William's Town (paper) and Port Elizabeth (plastic)	10 to 12 tons a month.
<b>Metal Master (industrial area)</b>	33.29558°S 26.49082°E	Strowan Road	Metal	Drive and walk by drop offs	Compressed and sent to Port Elizabeth	10 tons
<b>Metal Master (central town)</b>	33.30755°S 26.53647°E	2 Cloncore Street	Metal Plastic bottles	Drive and walk by drop offs	Metal compressed and sent to Port Elizabeth Plastic bailed and sent to Johannesburg	70 tons metal 2 tons plastic
<b>Masihlule Project</b>	33.29298°S 26.4908°E	Adjacent to Grahamstown Land fill site, Strowan Road	Cardboard/ paper Metal Plastic Glass bottles	Workers collect from adjacent landfill site. Items collected from Rhodes University.	Cardboard to Grahamstown Recycling. Paper and glass compressed and sent to Port Elizabeth. Metal sold to Metal Master (industrial area). Plastic melted down to be made into poly-timber to create bins, chairs, tables, and flooring (Kohly, 2011).	5 tons glass 12 tons paper
<b>Centre for Social Development</b>	33.31211°S 26.51918°E	5 Prince Alfred Street	Paper Plastic bottles Household left over's (e.g. toilet rolls, egg boxes)	Drive and walk by drop offs	Items taken by teachers improvised schools to use in their class rooms. Materials used for activities at schools, ages 1 and a half to 5 years old. Items not used are sent to Masihlule	Not known
<b>Makana Glass &amp; Bottle Recyclers</b>	33.30787°S 26.53564°E	4 Samson street	Glass Furniture	Drive and walk by drop offs Furniture collected	Glass compressed and sent to Cape Town Furniture recycled and refurbished	Glass 30 bags 1m cubed
<b>Dhindsa Trading</b>	33.30753°S 26.53596°E	Victoria Street	Metal	Drive and walk by drop offs	Compressed and sent to Port Elizabeth	Not known

## **Municipality**

Interviews with Ndumiso Nongwe, the Environmental Manager in the Makana Municipality, and Johann Esterhuizen, the Manager of Environment and Cleansing, were conducted. Many issues surrounding solid waste management arose, and due to the nature of the information gathered, it will be communicated through the discussion section.

### *Departmental Duties*

The Environmental Management department of the municipality was set up after the release of the Local Environmental Action Plan in 2004/2005. This document set out guidelines for the municipality to help develop community vision, assess environmental issues, set priorities, identify the most appropriate strategies for addressing the top problems, and implement actions that achieve real environmental and public health improvements (Makana Municipality, 2005: 1). Nongwe stated that the specific tasks he oversees are the implementation of new strategies and regulations regarding environmental issues, as well as controlling and managing the issuing of landfill permits. He claims that currently the government is avoiding issuing permits for landfills as they want to focus more on encouraging people to dispose of waste in more sustainable methods. His current aims are to encourage people to produce less waste and to improve the landfill sites. Furthermore, he has the responsibility to employ environmental facilitators in the community, who help to initiate and control waste management strategies, especially in the East. Nongwe also issues money for the environmental projects in and around Grahamstown. Such projects include enhancing the level of environmental participation within schools and businesses in the area.

## **The Media**

Various articles from the local newspaper, Grocott's Mail, were investigated to understand the state of solid waste management and recycling in Grahamstown. Results found from the investigation are shown throughout the various discussion sections below.

## **Discussion**

### **What is happening in the environment?**

*What happens to household and commercial waste in Grahamstown?*

In the interview with Johann Esterhuizen, he states that the landfill site receives domestic, garden waste and building rubble. In 2009-2010, domestic waste was approximately 38 000 cubic metres, garden waste estimated at 38 485 cubic metres and building rubble at 18 000 cubic metres. From 2010 July to 2011 June, domestic waste was estimated at 34 000 cubic metres, garden waste 35 081 cubic metres and building rubble was approximately 18 051 cubic metres. The landfill site is open for 24 hours and they monitor the waste that comes in during working hours, which they weigh and after working hours other businesses dump their waste in the landsite (Esterhuizen, 2011). Because of this, the numbers given are mere estimates, but they nevertheless indicate a considerable drop in domestic and garden waste taken to the dump.

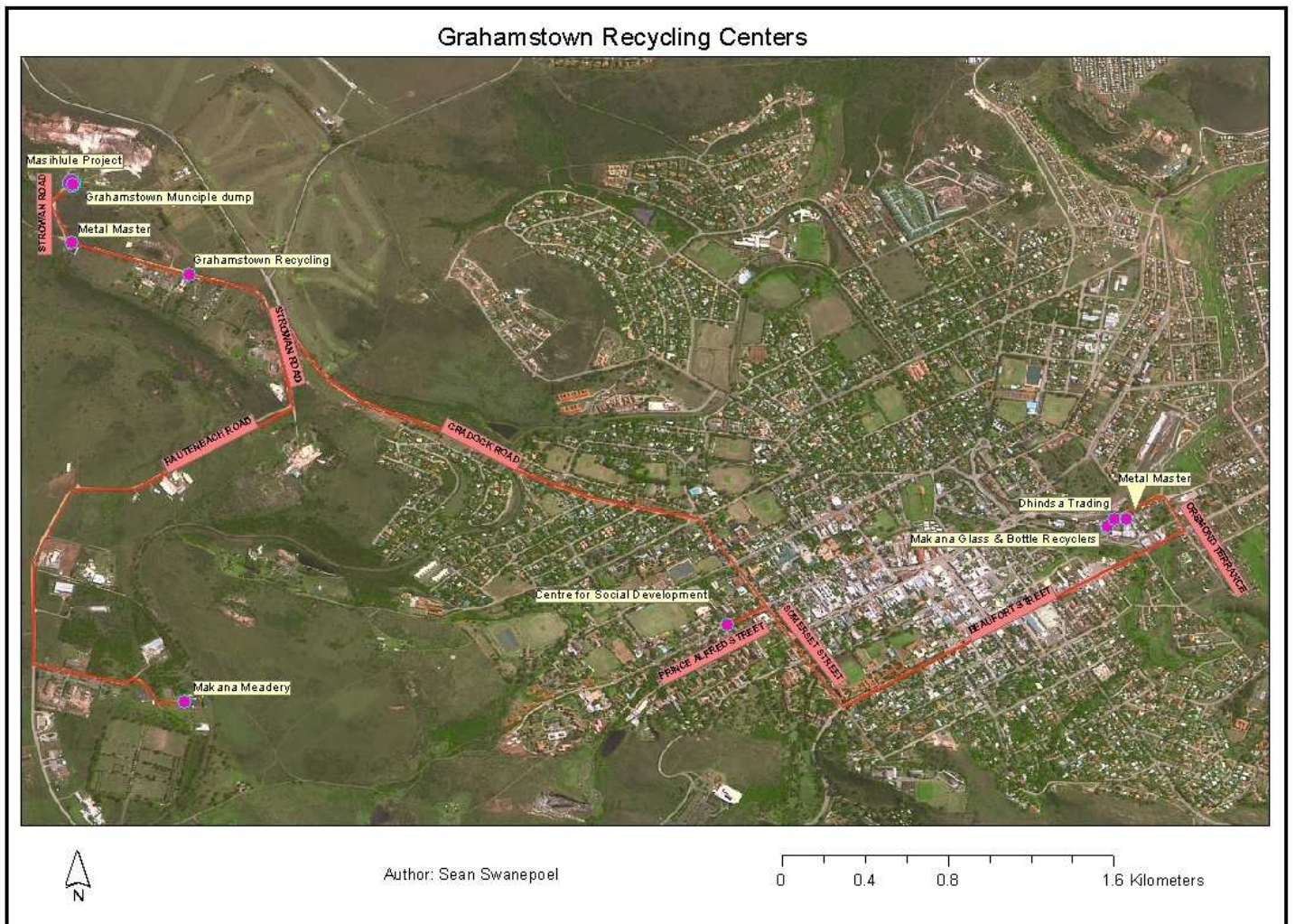
Most households and businesses in town use the municipal waste removal system, where the waste is taken to the landfill where sorting takes place, or else sorting is done at home and is taken to the landfill sites separately.

In the interview with Mark Hazell, he said that building waste from Rhodes University that goes to the landfill site should be minimised, and that there is a lot of room for improvement for this. Building waste that is currently taken to the landfill site includes bricks, rubble and conducting wire. Garden waste includes grass cuttings which are added to the compost dump, and trees that fall or are cut down. Often with trees, the staff members are encouraged to chop up the wood and use it at home or sell it to others (for example, the trees being cut down outside the chemistry department at the beginning of October). Huge amounts of food waste is produced by Rhodes University through the residence kitchens, most of which is sold to the pig farmers outside Grahamstown. The rest of the food is composted in the quarry behind the Hillside residences, even though it does not entirely comply with legislation. There is another composting area in the Rhodes nursery, although complaints regarding smell and the fact that it is visually displeasing has hindered its effectiveness. Toxic waste, such as batteries and chemicals, is collected by the Pharmacy department and transported to Port Elizabeth where it gets separated. Fluorescent light bulbs also need to be dealt with carefully because they contain Mercury- these are taken to electrical shops in town where they are either

encapsulated in cement and disposed of, or the different elements are separated and dealt with accordingly. The disposal of old computers on campus is referred to as bad electronic waste (e-waste), where the responsibility to dispose of the e-waste is transferred to the new owners (deserving communities/schools) who more than often do not know the correct way of doing it. In terms of recyclables on campus, many residences have recycling drives and all of this rubbish is taken separately to the landfill site where the Masihlule team sorts through it.

*Are the recycling projects in Grahamstown making a difference?*

Grahamstown has a variety of recycling centres clustered in two different locations- either in the central or in the industrial area of Grahamstown (Rautenbatch Road). This means that there is a need for the residents to transport their rubbish to the centres themselves (almost all of the projects do not collect), and it is out of the way for many people. Residents have confirmed this, from results in the household survey, stating that one of the reasons they do not recycle is because the centres are located too far away from their homes. From the household surveys we can see that people do not have the time to drop off recyclable items thus if items were collected, more recycling would probably occur. Another reason for a lack of recycling by residents is because they are unsure as to where the centres are located, thus Figure 14 has been produced for locals to clearly make out each of their locations. Table 1 in the results section provides GPS coordinates and data collected from each centre. It is projected that Figure 14 could improve participation in recycling by households in Grahamstown.



**Figure 14:** Grahamstown recycling centres.

The data collected from these centres revealed that they were undermanaged. The figures provided for ‘quantity recycled each month’ were inaccurate, which could be attributed to the fact that the employees lack skills and do not know how the business runs. These quantities also fluctuate each month depending on the amount of rubbish brought in by residents, so these are probably not reliable estimates. When visiting the centres, it was evident that the managers often leave the business in the employee’s control- and since these employees lack the skills to run a business, this is probably hampering the ability for the businesses to expand and thrive. Businesses where this was evident include Metal Master (in the industrial area) and Dhindsa Trading.

However some businesses show great potential for expansion and sustainability, one of which is the Makana Meadery. They have initiated new projects over the years including the production of ethanol from water, and working on the Grahamstown wind farm proposal (Cambray, 2011). The Masihlule Project also shows great potential for the Grahamstown

community through job creation. There has been an increase in demand for the products which they create from the recycled rubbish, which should encourage them to expand (Charles, 2011). The project has also led to the development of two self-help groups (Adams, 2011) which are aims at empowering women and reducing poverty.

Nongwe stated in his interview that there is an increasing number of people who are attempting to initiate their own recycling initiatives in Grahamstown, with specific interest in glass recycling. However, if the correct connections are not established and businesses are not well coordinated, they can often fail (Nongwe, 2011).

Rhodes University residences and departments are big contributors to the quantity of recycled material in Grahamstown. The results show that most students want to recycle and are encouraged to recycle and believe it makes a difference. The results also show that many of those that recycle at university do not in fact recycle in their family household. This could be due to the fact that each residence has an environmental representative, and recycled material is collected from points around campus by the Masihlule team, making the recycling process easy. This is promising for the future of sustainable methods at Rhodes University. Mark Hazell reiterated this in discussing the efficiency of the two-bag system that Rhodes has adopted, where staff and students can separate their own rubbish into recyclable material and normal rubbish (Hazell, 2011). The Masihlule team then retrieves as much of the recyclable material as possible, and they send glass to the Grahamstown Glass Recyclers. Metal gets taken to individual recyclers, and they either use it as scrap metal or it gets taken to Port Elizabeth (Hazell, 2011).

With regards to households, Grahamstown households are aware of some sort of recycling initiatives taking place in Grahamstown. Over 50 percent of residents in both the East and the West are aware of recycling initiatives, however less than half actually do recycle.

When considering whether the recycling projects have made a difference, it is clear from what is stated above that without the Masihlule team at the landfill site and various other recycling projects- there would be absolute minimal recycling occurring. In terms of Rhodes University, the process is efficient, and the recycling businesses do enough to ensure that people have the option to recycle. The rest is up to the individuals to take it upon themselves to do so. In terms of households, there is inconclusive evidence to state whether the initiatives are making a difference. We have put this down to the fact that residents have to transport their rubbish to the locations themselves, as there is not yet an official two-bag system for the

general Grahamstown region. There are of course other reasons why household members do not recycle, but this has more to do with the individuals themselves and not the recycling businesses.

### **Why is it happening?**

*How do social and economic factors (e.g. education, income, location) influence people's attitudes towards domestic waste disposal?*

With South Africa being a developing country and an extremely diverse society, it is important to look at socio-economic factors when implementing any forms of management (Poswa, 2004: 1). Effective management of solid waste involves evaluating and recognising how socio-economic factors may influence public co-operation and participation in management projects that are implemented (Vining *et al.*, 1992: 786). Examining the relationship between municipal solid waste and the socio-economic status of the respondents also helps us to get a better understanding of the relationship between factors such as income and employment and the overall status of the environment (Yusof, 2004: 25). Previous research shows that there is often a correlation between a person's socio-economic status and their attitudes and practices regarding solid waste management (Yusof, 2004: 25). Vining *et al.* (1993: 787) discusses that people of higher socio-economic status often tend to have more concern of higher order issues such as environmental problems. People of lower socio-economic status are often more concerned with issues related to basic needs such as food and shelter. This was a feature that became apparent during our data collection.

In our study it was found that people that lived in the West generally had higher income and employment levels compared to the East. The occupational status trend observed in our results was however not representative of the employment situation in Grahamstown as currently there is over 70 percent unemployment in Grahamstown (Abahlali, 2010: 1). This is one fact that might have made our study biased as it is not fully representative of the Grahamstown situation. The level of participation in terms of recycling was also higher in the West. This supports the assumption that areas of higher socio-economic status tend to have higher participation in solid waste management practices. A similar finding was found by Yusof (2004: 56) where recyclers were found to be respondents of higher socio-economic status. They were found to have more awareness and consciousness on environmental issues

and were less responsive to rewards. When comparing with the East where a lower socio-economic status was found most respondents stated that their main reason for recycling was to either save or earn money. When asked what should be done to encourage recycling a large population in the East stated that if they were given a financial incentive then they would be encouraged to recycle. Abel (2007: 535) also discusses that areas of higher socio-economic status also tend to generate more waste as waste generation often increases with income. In this study a similar trend was observed with areas in the West generating more waste than in the East even though households in the East had a higher average number of people per household. Having most of the people who recycle living in the West was a positive sign as this is where households generated a higher average amount of waste.

In this study we noticed a strong correlation between those who had completed university and those who recycled. A higher willingness and incentive for proper domestic waste management is often expected in people with higher levels of education as they are expected to have a higher knowledge of environmental issues (Kamara, 2006: 34). Kamara (2006: 60) also discusses that educated people tend to have a greater chance of being reached by formal public environmental education such as the media since they can often understand the language of broadcast. In our study, when respondents that recycle in the West were asked how they knew about recycling, over 90 percent of the respondents had said they had heard from the media. In the East however most respondents said they had heard either through word of mouth, education or the municipality. The municipality should therefore recognise its role in educating people on these issues and should strive to reach the many more that are still uneducated about solid waste management issues through these mediums.

During the interview with Mr. Ndumiso Nongwe, he frequently emphasized the difference in attitude towards recycling between the West and the East. While literature frequently discussed that areas of higher socio-economic status often have better attitudes surrounding solid waste management issues, Nongwe stated that he thought the wealthier people of Grahamstown were the ones ignorant to waste management issues. He stated that the attitude towards recycling in the East is far better than that in the West. When discussing this he pointed out that in the East, people are more conscious of other uses for everyday objects and instead of throwing things away they will often try and reuse waste for other purposes. He stated that while people in the East may not recycle in the conventional way (i.e. by going to recycling centres), they recycle far more through personal reuse of waste. Nongwe further

discussed that people living in the West often do not have much regard for waste management (Nongwe, 2011).

We can see from this evidence that there are some contradictory ideas; however, it is assumed that both concepts work because of the different types of people living in the East and West areas.

### **What will happen if we do not act now?**

*What is the effect of illegal dumping sites on surrounding households?*

A significant proportion of the respondents interviewed in the household surveys said they were affected by the dumping of waste in unauthorised areas. When the respondents were asked how they were affected by illegal dumping, issues raised included the spread of diseases, pollution of the environment and contamination of the water in nearby streams. The respondents said that the waste attracted flies and rodents and these contributed to the spread of diseases. The majority of people living near the dumps complained a lot about the bad odour caused by the waste that is dumped in these areas. Residents also made reference to the dumps as being a danger to children because some of the areas that people are using as dumps are also used by children as playgrounds. The dumps were seen as a danger because children could come across sharp metals and broken glass in these areas. According to Andrews (2010: 1), residents in Irving Heights complained of people dumping dead carcasses in open spaces, causing the dumping of waste to be a serious health hazard. Residents in Hlalani complained of a nearby dumping site saying that it attracted mosquitoes and rubbish was spread so far into the road that it made it hard for cars to pass (Ndawuni, 2011: 13). Other respondents complained that the litter from the illegal dumps was blown onto their yards, causing them to have to pick up litter in their homes every day.

A lot of people blame the municipality for the formation of dumps, saying that there weren't enough refuse containers put out in open spaces (Andrews, 2010: 1). Some people, however, blame fellow residents, saying that they do not put their waste in the containers, even in areas where they were made available. Makana Municipality spokesperson, Mr Thandy Matebese, said that the municipality does not have enough money to purchase refuse containers for every open space and so it is the responsibility of the residents to dump their waste in the

containers, where they are made available to them, or otherwise wait for their refuse to be collected (Xoli, 2011: 1). Mr Matebese went on to say that the municipality implemented the same strategies in both the East and the West but the problem was less severe in the West than in the East. This shows that illegal dumping of waste has a lot to do with the behaviour of the residents and not just poor service delivery from the municipality.

Most of what is happening in terms of dumping of waste seems to be caused by the residents themselves as they fail to comply with the laws that the municipality has put in place. Residents have been reported removing 'No Dumping' signs in some areas, making the problem lie in their own hands rather than in those of the municipality. The Grahamstown community hopes to alleviate the problem by employing people to police such behaviour and fine anyone who is found dumping illegally (Ndawuni, 2011: 13; Nongwe, 2011).

If these unsustainable practices continue, the situation could worsen and lead to devastating consequences such as deterioration to the environment and major health issues. On the positive side, the municipality is attempting to alleviate the situation through their current education projects and as mentioned above, by employing environmental facilitators in the community.

### **What are the opportunities and constraints? What are, or can we do about it?**

#### *What are people's attitudes towards waste? (Attitudes)*

A person's attitudes and beliefs are a major determining role in the environmental behaviour of recycling and a positive attitude is essential in implementing an effective solid waste management system (Yusof, 2004: 54).

The attitude towards municipal waste removal services was much more negative than what we were expecting, but this could be attributed to the municipal strikes that occurred this year which has caused major disruption in municipal waste services.

In a study done on the level of household participation in domestic disposal and recycling in the Tshwane Metropolitan Area it was found that when it came to recycling and waste sorting, people in the area had different perceptions and opinions but overall the general level of awareness was found to be quite low (Kamara, 2006: 60). Almost a quarter of the

respondents in this study were of the opinion that there wasn't a relationship between waste sorting and the environment. In our study, our household assessment revealed that most Grahamstown residents thought that recycling initiatives were important, which is optimistic for the municipality, because the initial idea of recycling has been sown. It was evident both in the residences and household surveys that there is a lack of knowledge regarding laws around solid waste management and recycling. However, they are aware that dumping and improper methods of waste disposal do cause damaging effects to the environment and human wellbeing.

Education is one way to develop positive perceptions and actions towards environmental protection and conservation, and thereby increase the level of participation of proper solid waste management and recycling in a community (Kamara, 2006: 62). It was also hypothesised that a low level in domestic waste management could have been influenced by institutional factors or various socio-economic factors such as level of education, wealth or income (Kamara, 2006: 62). This was reiterated by Rob O'Donaghue, the Director of the Environmental Learning Research Centre, who states that if perceptions are changed at a young age, and the environment is made a higher priority in people's lives, then there is hope for our future generations. Of course, it is understood that changes do not occur overnight, especially since the younger generations being taught now will only have a notable influence over their family practices in many years to come. However, Kevin Whittington-Jones, the Director of Coastal Environmental Services in Grahamstown noted how the attitudes of the Grahamstown community have changed over the years, along with the municipality having made recycling a priority, and funds are being pushed into recycling initiatives such as the Masihlule project (Whittington-Jones, 2011). He mentioned how in the past, you would find abattoir meat, hazardous materials as well as hospital and medical equipment in the landfill site, but now with all of the new legislation in place in South Africa and the implementation schemes, three principles have been made important. These are that 1) people have a duty of care towards our environment, 2) the polluter will pay (even if indirectly through environmental degradation), and 3) a precautionary principle that states that if you are not sure whether what you are throwing away is bad for the environment, then treat it as hazardous anyway (Whittington-Jones, 2011).

Another primary setback for efficient waste disposal is the actions of the members of the community. Nongwe pointed out that where refuse skips are provided, people still throw the

rubbish outside the skip. This displays a complete disregard for the environment that can only be improved through education and law enforcement. Reference was made to the skips in open areas such as Joza and Fingo Village.

To conclude, it is evident that the importance people place on the environment determines whether they recycle or not, and at the same time, their education determines how much importance they place on the environment. Municipalities need to place more importance on their environmental projects and increase the funds going into environmental education. This way, if the people of the town notice that recycling has become a priority to the managers of our city, there will be more incentive to do the same.

*What are the barriers to having an effective waste management system? (Limitations)*

A key feature of the interview with Ndumiso Nongwe was the challenges that arise in less developed countries such as South Africa with regard to implementing and carrying out effective and beneficial waste management strategies. The main problem that seems to prevent such initiatives is a lack of budget for environmental departments which has to be divided amongst many different environmental needs. Nongwe stated that he has put forward many business plans for his intentions to improve solid waste management, but as of yet he has only received funding for very few of them. It is not a lack of enthusiasm to protect the environment but rather that the scarcity of funds that is characteristic to less developed countries results in difficulty in giving proportionate funds for projects (Nongwe, 2011). There is a struggle to balance the primary needs of jobs, food, shelter, water and electricity versus the need to protect and improve our environment. New development creates new jobs and brings an income to many families that need it, but on the other hand, development means an increase in waste production and essentially adverse effects on the environment. Nongwe states that acquiring funds for environmental projects which do not directly improve livelihoods of the community is difficult and often not achieved. The lack of funding also explains the lack of infrastructure in the East, and therefore less efficient municipal collection schemes.

According to Imam *et al.* (2008: 470), with the rapid increase in human population there are difficulties associated with providing an effective solid waste management system, so as

cities grow, land becomes increasingly complex and the waste generated increase in volume and variety.

As previously mentioned, the National Waste Management Strategy goal is to minimise the waste that is created, by recycling, reusing, and recovering. There are however, barriers to the efficiency of recycling projects in Grahamstown. Some of the recycling businesses outlined these in the interviews as being lack of education about recycling, monetary issues and administration capacity, ignorance and lack of proper infrastructure. According to Parsons and Kriwoken (2010: 474) small to medium–sized enterprises in Tasmania, Australia were also faced with major barriers to recycling which included inadequate storage space, lack of staff allocated to sort and recycle and paucity of readily available information on recycling services. Nongwe stated that the problems that recycling faces happen at a household level, where people do not feel encouraged to recycle because there is no real incentive. If a reward were offered for recycling waste, the amount of waste making it to the landfill site would diminish considerably.

In the commercial sector, there are many businesses that are willing to participate in recycling, but the municipality does not currently provide easily accessible bins for their different items, and thus there is a low level of recycling businesses in Grahamstown. At a household level, the Municipality also cannot afford specific recycling removal trucks, so people without their own form of transport resort to using the general municipal waste collection services.

*How can municipality intervene to facilitate household participation in proper domestic waste management? (Recommendations)*

From the interview with Ndumiso Nongwe it was found that there are many projects currently underway to improve the solid waste management systems of Grahamstown, however difficulties arise due to lack of funding and lack of interest. The Local Environmental Action Plan suggests that to improve these situations, there needs to be a move to community based and collaborative decision making. Makana Municipality does do this to a certain degree, but it can be taken a lot further, by holding meetings with community members, where ideas are discussed which should allow a well rounded involvement of stakeholders (Makana Municipality, 2005: 23). Citizen collaboration is the cornerstone of

LEAP and if it can be properly implemented in Grahamstown it could lead to a move towards more effective management techniques. A recurring concern among the respondents that we surveyed was that there was not enough information on how one can recycle or effectively manage their waste. Hosting workshops, information sessions and handing out things like fliers can help to increase knowledge about the type of waste management techniques available. Gamba and Oskamp (1994: 590) discuss that the availability of information on how and why one should recycle also plays a role in recycling behaviour among residents. When designing a solid waste management program, it is imperative that any factors that may affect a person's environmental behaviour are considered to ensure its effectiveness (Yusof, 2004: 53).

The Local Environmental Action Plan also states that to achieve effective management techniques, municipalities must set project goals to achieve the desired outcome. Nongwe discussed in the interview the goals that they have set for the future. These include creating a recycling system much like those seen in Sweden and other European Union countries, not having to create a new landfill site in the future, and to change the attitudes of the community so that everyone recycles their waste (specifically through education).

The National Waste Management strategies and Action Plans highlight the level to which recycling needs to be promoted in South Africa. Taking this as an example, it is clear that recycling needs to be encouraged a lot more from our municipality.

In terms of the National Environmental Management: Waste, the Makana Municipality is currently following the objectives as set out in the recommended business plan in the LEAP (Makana Municipality, 2005: 2) whereby they are achieving or set to achieve:

- 1. To form a recycling company in partnership with Makana Municipality.*
- 2. To develop a business centred around sound business practice*
- 3. To ensure that recycling is sustainable in Makana Municipality*
- 4. To minimise land filling*
- 5. To create jobs*
- 6. To investigate options for processing and value adding to recycled products.*

Our Municipal Managers have set their goals to be in line with these achievements, now more funding needs to be directed to these goals so that they can come to life (Nongwe, 2011).

In specific situations such as municipal strikes, the municipal managers need to mitigate the effects of disruption to waste services by sending out different rubbish crews during periods of strike, and training the employees on methods of effective waste pick up and removal to help mitigate bad practices such as leaving a mess behind.

In mitigating the effects of scavengers and dogs opening bags when rubbish is put out on the street for municipal waste pick up, funds should be allocated towards providing bins for rubbish to be in instead of plastic packets. This would then minimise the amount of litter left lying on the ground after pick up has occurred and would in turn improve the levels of satisfaction of the community members towards the towns waste management methods.

Nongwe did mention that they had started issuing free black bags to households in both the East and West regions; however corruption in the system stopped any households from ever seeing them. If more reliable workers were employed to distribute the free plastic bags then this problem could be overcome. Issuing free bags is one step to encouraging members not to litter, incinerate or dump their rubbish illegally.

Even though the problem of lack of funding has been dealt with, it is worth mentioning that if the municipality improved their recycling facilities and did not require residents to deliver the recyclables, this would surely encourage the members of the community to recycle.

When discussing with Mark Hazell what he thought could be done to improve the municipality's efficiency, he said "the municipality here does not see it as their role to facilitate recycling initiatives, but this is incorrect. There should be facilitation between the municipality officials and Parks and Recreation Department to ensure that projects run smoothly". This follows a concept of buy-in from people in positions of power. If the officials were to engage with the recycling businesses, they could become more efficient. With the implementation of the Greening the City project, this has been attempted.

In the interview with Nongwe, he strongly stated that education at the school level is the most effective means for encouraging a holistic change. He described the implementation of certain strategies at local schools, including the provision of recycling bins so that children can bring their recyclables with them to school. His next strategy is to start Eco Clubs which will have the objective of maintaining and encouraging good waste management practices throughout the community. Progress can already be seen at the Environmental Learning Research Centre at Rhodes University. This centre, run by Rob O'Donoghue, specialises in

training members of the public as well as leaders of business in effective environmental practice- the result of which is more people knowing how to properly mitigate their environmental impacts.

## **Conclusion**

The problem as mentioned by Nongwe is that there is a lack of funding for environmental initiatives as money has to be spent wisely in order to enhance people's livelihoods, improve employment figures and to improve environmental circumstances. Due to the large inequalities of income in South Africa it becomes increasingly difficult for governments to issue enough money to departments such as the environmental department. However, according to Mark Hazell, the level our municipality has achieved in terms of solid waste management in comparison to many other Eastern Cape and South African cities is highly impressive. In light of this, it's clear that the municipality is doing an efficient job in terms of meeting legislative requirements and therefore should be meeting its waste management goals in the near future. To achieve our goals within a realistic time period, it is necessary to obtain an increased budget. This could happen through Non-Governmental Organisations who should get involved in municipal waste management projects especially if they have the means to mitigate costs or donate services or money. In order to gain this help, Nongwe must keep active as Environmental Manager and follow through with planned initiatives to encourage more effective waste management and education. With environmental education projects currently underway in the East we hope to see a change in the future where recycling will be of higher importance and waste will be minimised accordingly.

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