

**WASTE MANAGEMENT THROUGH RECYCLING AND COMPOSTING: A CASE
STUDY OF SOME SCHOOLS IN GREATER EDENDALE, PIETERMARITZBURG,
KWAZULU-NATAL**

By

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ABSTRACT

The study investigated the involvement of primary and secondary schools in waste management through recycling and composting, and the perceptions of teachers and pupils with regard to waste management. It also investigated the local municipality's attitude towards using schools to inculcate the culture of own waste management. It further investigated some of KwaZulu-Natal's recycling industries/agents' attitudes toward using schools as "mini" depots for collection of recyclable materials.

It was found that according to teachers perceptions most of the primary schools are engaged in waste management practices through recycling and composting, while secondary schools are less involved in waste management practices through recycling and composting. The results revealed that 53% of primary schools are involved in recycling projects, while only 10% of secondary schools are involved. It was also found that both primary and secondary school teachers are willing for their schools to be involved in waste management practices. Primary school pupils are more enthusiastic in collection of recyclable materials and composting projects as means of waste management as compared to secondary school pupils who are less interested.

The results further revealed that there are no educational programmes that are initiated by the Pietermaritzburg-Msunduzi Municipality to inculcate the culture of waste management among the school pupils. There are a few industries that collect recyclable materials from schools in Greater Edendale by putting paper banks in some of the schools. It was also found that the Keep Pietermaritzburg Clean Association has an educational programme for waste management with some of the schools in Greater Edendale. This programme is called Environmental Award System for Youth (EASY), whereby schools receive awards for activities that they are involved in to manage waste.

It is recommended that organisations such as the Greater Edendale Environmental Network be encouraged to establish educational programmes to help motivate and make pupils aware of the value of waste management. Recycling industries should also target primary and secondary schools for collection of recyclable materials, rather than only focusing on tertiary institutions. If this is done children will gradually become aware of the concept and value of recycling. Through the involvement of schools in waste management the public can be educated more to the role of responsible waste disposal and management.

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I also wish to extend my thanks to the Department of Education and Culture for allowing me to collect data from the schools in Greater Edendale for the purpose of this study.

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Special mention must be made of Mr R. L. Scanes Pietermaritzburg-Msunduzi Municipality Waste Management Division Head, Mr Alton Buthelezi the driver of the refuse truck that collects refuse in the Greater Edendale, Ms Cherie Barrowman Environmental Officer of Keep Pietermaritzburg Clean Association and Mr B. L. Lurie of Dumol-Lurie cc: Recyclers of Waste.

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To all people who contributed towards the success of this study I say “Those who give have all things. They who withhold have nothing”.

DECLARATION

I, Felix Thembinkosi Nxumalo, declare that this dissertation is my own original work, and that all sources of information have been acknowledged.

This work has not been presented to any other University for the purpose of a higher degree, and it is the result of my efforts under the professional guidance of the Supervisors whose names and signatures appear below.

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DEDICATION

This work is humbly dedicated to my parents Simanga and Nomusa (MaSkhosana) Nxumalo, who made my life even more meaningful and worthwhile.

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INTRODUCTION

“The purpose of the Green Paper on the National Environmental Policy for South Africa is to provide a basis for developing an environmental policy which will lead South Africa along the path of sustainable development. It must also ensure that all South Africans, both now and in the future, have an environment which always caters for their well-being” (Green Paper on Environmental Policy for South Africa, 1996: 2).

These were the words of Dr Pallo Jordan, Minister of Environmental Affairs and Tourism on October 28, 1996. The statement shows that the government recognises the need to protect the environment. One aspect that must be part of any such protection is the management of waste. Waste management can be more effective if it is introduced at primary and secondary levels of education where the children will practice the culture of waste management and make it their own. Although there are recycling bins found in tertiary education institutions, primary and secondary levels are neglected or bins are only found in principals offices.

There are many tertiary institutions that are involved in waste management such as the organised recycling initiative, coordinated by Dr Michelle McLean, of the Department of Psychology, within the Medical School at the University of Natal, Durban, and about 80% of Medical School departments are actively involved (McLean, 1997). Pupils at some schools are collecting tin cans but without understanding the underlying reasons for such recycling. Some pupils in some schools, especially primary schools, are engaged in composting with the aim of enriching the soil for their school vegetable garden but without knowing that composting is one of the means by which waste to be disposed of in waste disposal sites and landfills can be reduced.

Many people are unaware of the seriousness of the waste disposal problem. Landfill sites are rapidly filling and there is nowhere for solid waste to go. One solution is recycling, and another is composting. If kitchen and yard waste are composted, in addition to recycling papers, metals, plastics and glass, solid waste can be reduced by almost half. Everyday decomposition occurs naturally as leaves and vegetation fall to the ground. Vegetables and fruits are left to rot. Composting is an effective way to reduce organic waste. By composting at home there is an opportunity to becoming a part of the cycle of life. In just a few months, kitchen and yard waste can become nutrient-rich food for plants and vegetables.

According to KwaZulu-Natal (KZN) - Waste Policy, Phelamanga Projects, growing public concern over environmental quality, together with increasing regulatory requirements for safe waste disposal, have created an urgent need for a waste management policy and education in KZN. The years 1995 and 1996 proved to be milestone years in the awareness of the waste situation in KZN and culminated in Minister Prof. Kader Asmal, setting up a Governmental Task Group to investigate waste management in KZN. Furthermore, in the Provincial Parliamentary Budget discussion in June 1996, the MEC for Traditional and Environmental Affairs highlighted the need for KZN to have such a policy. Furthermore, Mr Raubenheimer, Secretary for Traditional and Environmental Affairs, has recently mandated the directorate of pollution control to develop such a policy.

The waste problem in Greater Edendale is ever increasing due to a rapid increase in population and an influx of people from rural to this urban area. Disposal and landfill sites are becoming less available or are sometimes sited next to residential areas (Appendix 7). This, in turn, can contribute to the spread of disease especially among the young, who are most susceptible because they play on the dumping sites unaware of the consequences (Plate 1). These problems can be alleviated if waste management education is introduced at an early age. Mr Maruma, executive chairman of EnviroServ Holdings, believes that we will have to improve waste management at grassroots level if we want to uphold the bill of Rights of the Constitution, which states that everyone has the right to an environment that is not harmful to their health or well-being (Fourie, 1997). People should also be made aware from an early age that the right to a healthy environment demands that people should manage their waste which is one cause of an unhealthy environment. The introduction of waste management at primary and secondary schools can serve this purpose and alleviate the health risk and a low environmental morale.

It has been observed that primary and secondary education institutions are generally not aware of the best possible ways to manage waste. Although school children explore illegal dumping sites searching for tin cans for their schools, they are not aware that they are in the process of waste management through recycling (Plate 2). Children should learn to practise separation for collection at schools, but this cannot be done successfully if Municipalities and recycling industries are not working in collaboration with the schools. Practising waste separation for

collection at schools will, in turn, be passed on by the children to other members of their communities. Thus Gore (1997: 9) argued that children are powerful allies to inspire a great respect for the land. He stated that “It is often children who remind their parents to recycle their cans, or to bundle their newspapers. It is often children who remind their parents of the simple miracle of nature - the crops that come from our farms, the parks and lakes and campsites where families and communities gather.” Because the environment affects the quality of the lives of the people, it is the responsibility of all to keep living- working- and learning-environments clean.



Plate 1 Children playing in the skip bin



Plate 2 Children searching for recyclable materials to bring to school

1. WORLD AND SOUTH AFRICAN PERSPECTIVES ON WASTE MANAGEMENT THROUGH RECYCLING AND COMPOSTING

1.1 WASTE MANAGEMENT THROUGH RECYCLING

Recycling refers to the process of returning materials to their raw material components and then using these again to supplement or replace new materials in the manufacture of a new product. “In a more general sense, recycling also means simply putting something you were going to throw away to good use” (Carless, 1992: 3). This means that when one reuses a bottle for storing other liquids or a plastic container to store food in the refrigerator one is practising recycling. The scrap recycling industry estimates that people were reusing scrap metal as long ago as 3000 BC; the re-use of waste paper and textiles goes back about half that far (The Kindred Association, 1994). This shows that recycling is not a new undertaking but has been around for millennia, like many other forms of waste management. Scrap merchants and scavengers collected what others no longer wanted and either repaired the item or turned it into something else that could serve a useful purpose. Materials such as rubber, metal, glass, tin, iron, and items such as cooking grease, string, razor blades and many others were all saved, either to conserve fuel and energy or to keep items that were difficult to obtain. As time went by people started to throw things away without thinking, rather than finding another use for them (The Kindred Association, 1994).

1.1.1 WORLD PERSPECTIVE

In America, although they currently recycle about 13 percent of their waste as a national average, many states and areas have significantly higher rates. In the past, municipal authorities tended to believe that recycling was too difficult to organise and that Americans would not sort their waste. But rapidly rising disposal costs and opposition to landfills and incinerators have forced state and county officials to take a serious look at recycling as an alternative (Carless, 1992). In the light of America’s solid waste disposal crisis which was imminent in 1992 it was obvious that recycling could play an important role in the management of waste (Carless, 1992).

In America, the recycling industry has been developing very rapidly even though the majority

of the population has been unaware of its existence. What began as community newspaper collection sites has developed into a multimillion-dollar industry that has spread across America. Communities from California to Maine have the opportunity to separate not only newspaper but plastics, paper products, glass, aluminium, and various other materials from their rubbish and thus significantly affect America's overall waste generation. In America, recycling is proving to be a far superior method of dealing with waste disposal problems than either landfill or incineration (Carless, 1992).

1.1.2 SOUTH AFRICAN PERSPECTIVE

Environmental awareness has led to a growing interest in recycling due to the realisation that recycling is a potential solution to the waste crises facing many South African communities. Due to the increased need for public awareness of littering, waste reduction and a cleaner environment, the Keep South Africa Beautiful (KSAB) campaign was created in 1978. This campaign has a broad set of goals, which include initiating large-scale litter-reduction and environmental activities and encouraging the recycling of waste (Myburgh, 1991). Although, South Africa only started recovering steel cans in 1992, in 1996 Collect-A-Can announced, through the media, that South Africa is recycling most of its cans and that more than half the steel cans used in South Africa are now being recovered and recycled (The Natal Witness, June 1996). The Managing Director of the company formed by ISCOR, Bevcan and Crown Cork, said the recovery rate of 51% makes South Africa the third most successful region after Japan (69%) and Germany (62%) (The Natal Witness, June 1996). South Africa is also engaged in recycling paper, metal, plastics and glass.

Every paper that is produced in South Africa has a recyclable content. That is why South Africa has paper pick-ups which are practised by companies such as Mondi to help members of the public contribute to the recycling of paper. The market for waste paper, is still fairly unstable with large surpluses for the lower grade paper. Some 570 000 tonnes of domestic waste paper was used to produce 29 different grades of paper and board during 1992 (Lombard, 1994). There are three known regional recycling forums operating in South Africa, namely the Western Cape, and Natal recycling forums, and the East Rand Waste Processing Forum. The KwaZulu-Natal

paper recycling industry is dominated by Mondi Recycling (Pty) Ltd; Nampak Paper Recycling (Pty) Ltd; and Sappi Waste Paper (Pty) Ltd, which together control about 87% of the market (Lombard, 1994). Among the companies involved in metal recycling, the Collect-A-Can campaign is predominant and the “scavengers” are searching rubbish dumps or landfills for scrap metals which they then sell to recycling companies (Plate 3).

In South Africa about 130 000 tons of aluminium are produced each year and about 36% of aluminium cans are recycled (Myburgh, 1991). There are so many types of plastic, and most commercial “plastics” are a combination of many types, some of which are difficult to recycle. This has resulted in different companies collecting only certain plastics. South Africa is a world leader in recycling plastics, recycling about 17% of its virgin plastic consumption. Bottles are the most commonly re-used containers in South Africa with approximately 66% of the 3.7 million glass bottles manufactured each day being either reused or recycled (Myburgh, 1991). Consol Glass is one of the glass recycling organisations and Ecobot operates a bottle recovery system for particular bottles (mainly wine bottles).



Plate 3 Desperate people in search of items they may be able to re-use

1.2 WASTE MANAGEMENT THROUGH COMPOSTING

“Composting is a natural process in which plant and other organic wastes are broken down biologically to produce a nutrient-rich material. The resulting compost can be used for soil improvement in individual gardens or on a larger scale in communities” (Carless, 1992).

1.2.1 WORLD PERSPECTIVE

Composting is enjoying a new found popularity in both developed and less developed countries. More and more people are composting waste at their homes. Many of these people are composting primarily to reduce their household waste. The Greater Vancouver Regional District (GVRD) in British Columbia, Canada has embarked on a programme of decreasing its organic waste through composting. The lead came from the Federal Government who told all Provinces that they had to reduce landfill waste by 50% by the year 2000 or else face a heavy tax. Each Province and ultimately each municipality was instructed to achieve this. The GVRD Solid Waste Plan was Vancouver’s response to what was in fact a Federal threat. In order to meet the

goal of reducing waste through composting, GVRD created a Solid Waste Management Plan that details how to cut down on waste production, and disposal of the remaining waste. In 1993, many Municipalities in British Columbia offered compost bins to residents at a subsidised cost of about \$25. This program was received very enthusiastically by the public, with the result that close to 45, 000 Lower Mainland households bought bins and embarked on backyard composting (GVRD Compost Resource Manual, 1993).

Towards the end of 1990 the GVRD began a backyard composting program whereby, in cooperation with the British Columbia Ministry of Environment, Lands and Parks, they created the first fully staffed Compost Demonstration Garden. The purpose was to promote the advantages and possibilities of home composting and educate residents on how to compost in their own backyard. They demonstrated to visitors a number of different compost bins in action. The Demonstration Garden also offered workshops to schools and the general public and conducted group tours. About 8000 residents visited the garden during the 1991 season (GVRD Compost Resource Manual, 1993). By also providing displays and workshops at community outreach events, the GVRD was able to contact thousands of individuals who had never considered composting as a means of waste reduction (GVRD Compost Resource Manual, 1993).

Some communities in Washington DC, United States of America use composting on a large scale and the practice is rapidly becoming more popular. Fairfield in Connecticut, opened a \$3 million composting centre in 1989 to create topsoil for parks, playgrounds, and public landscaping. Likewise, University City, Missouri, began a leaf composting program in 1983 when the city realised that leaves represented about 15 percent of its waste stream (Carless,1992).

Some less developed countries such as Kenya, Brazil and India are practising backyard and neighbourhood composting. “In Olinda, Brazil, the neighbourhoods of Peixinhos and Bonsuccesso have set up small composting units on plots of about 250 m² (equivalent to about two residential plots in a high-density settlement)” (Lardinois, 1993). In Accra, Ghana, there was an experimental, decentralized small-scale composting project, whereby screening drums were introduced to sort waste materials (Plate 4). “At each composting site a drum ‘driver’ supervises

the deliveries of household waste, making sure that the heaps are properly stacked, and he retrieves reuse items from the waste (plastic, bottles, tin cans, plantain shells, etc.) that he can sell” (Lardinois, 1993).

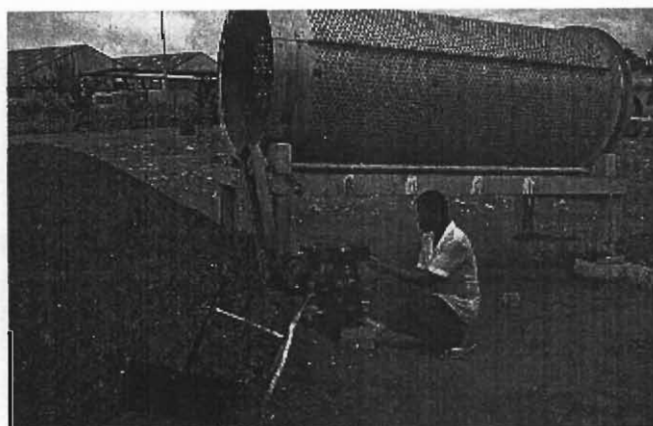


Plate 4 Screening drum driver in Accra, Ghana: source Lardinois (1993).

1.2.2 SOUTH AFRICAN PERSPECTIVE

For more than two centuries compost and manure were the only sources of plant nutrients in South Africa. The rich deposits of bird guano off the South African coasts were later used to a certain extent (Schliemann, 1980). In the early nineteen forties the Department of Agriculture launched an intensive campaign to promote the composting of all sorts of wastes (Schliemann, 1980). Even urban refuse and sewage sludge were put to use and, with the aid of proper composting, contributed to the urgently needed supply of plant nutrients (Van Vuuren, 1949).

Composting in South Africa fell into general disfavour when the fertiliser industry was established, and fertiliser could be provided relatively cheaply. The idea of composting was only revived when the Soil Conservation Board considered urban and farm compost a potential weapon against soil erosion (Schliemann, 1980).

Despite an extensive literature search no formal literature on composting in South Africa has been found. However, the Department of Agronomy at the University of Natal, Pietermaritzburg is working with the schools in Greater Edendale to initiate composting projects

(Appendices 1 and 2). This is part of the overall aim of the current project which is to investigate the best possible ways of inculcating the principles of waste management into primary and secondary schools with particular reference to composting projects and recycling of household waste.

2. OBJECTIVES AND METHODOLOGY

2.1 OBJECTIVES

The objectives of the study were as follows:

- to investigate the involvement of primary and secondary schools in waste management, and the perceptions of teachers and pupils with regard to waste management;
- to establish the nature and quantity of waste generated in both primary and secondary schools;
- to investigate the dangers that face children who explore dumping sites, searching for recyclable material;
- to investigate the potential for conversion of schools' organic refuse into compost for soil improvement and as a plant growing medium;
- to convey the message of the three 3Rs - REDUCE, REUSE, RECYCLE - to elementary students;
- to investigate the local municipality's attitude towards using schools to inculcate the culture of own household waste management; and
- to investigate KwaZulu-Natal's recycling industries' attitudes towards using schools as "mini depots" for collection of recyclable materials.

2.2 METHODOLOGY

2.2.1 THE STUDY AREA

The study area consisted of Greater Edendale, which is part of the Greater Pietermaritzburg-Msunduzi TLC. Greater Edendale is approximately 10 kilometres from the centre of Pietermaritzburg. The study concentrated on 25 schools of which 15 were senior primary schools and 10 were secondary schools. These schools are situated in the following residential areas of Greater Edendale: Ashdown; Azalea; Caluza; Dambuza; Edendale; Esigodini; Imbali; Pata; Machibisa; Slangspruit; Smero; S'nathing; and Willowfountain (Figure 1). The primary and secondary schools chosen, as well as the district under which they fall and residential

areas where they are situated are given in Tables 1 and 2.

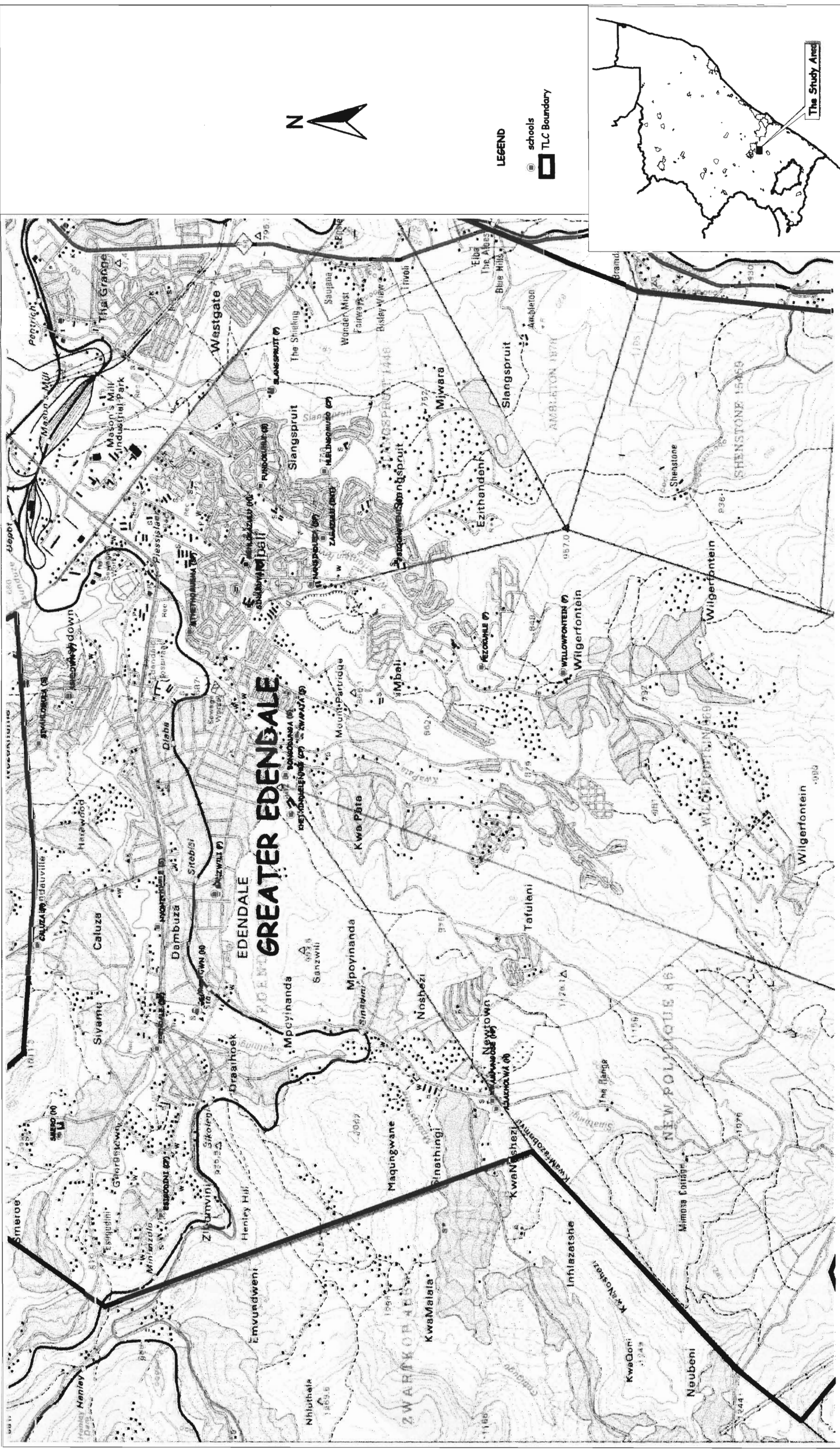
Table 1. Primary schools chosen for the study. * indicates those schools selected for the pupils questionnaire.

NAME OF SCHOOL	DISTRICT	RESIDENTIAL AREA
1. Ashdown	Midlands	Ashdown
2. Caluza	Midlands	Caluza
3. Edendale*	Midlands	Edendale
4. Esigodini	Midlands	Esigodini
5. Fezokuhle*	Pietermaritzburg	Imbali unit 18
6. Hlelingomuso	Pietermaritzburg	Imbali unit 15
7. Khethindlelenhle*	Pietermaritzburg	Azalea
8. KwaMpungose	Pietermaritzburg	S'nathingi
9. Mthethomusha	Pietermaritzburg	Machibisa
10. Nansindlela	Pietermaritzburg	Imbali stage 2
11. Sanzwili	Pietermaritzburg	Dambuza
12. Sinamuva*	Pietermaritzburg	Imbali
13. Slangspruit	Pietermaritzburg	Slangspruit
14. Willow fountain	Pietermaritzburg	Willow fountain
15. ZamaZulu	Pietermaritzburg	Imbali stage 2

Table 2. Secondary schools chosen for the study. * indicates those schools selected for the pupils questionnaire.

NAME OF SCHOOL	DISTRICT	RESIDENTIAL AREA
Amakholwa*	Pietermaritzburg	S'nathingi
BonguDunga	Pietermaritzburg	Dambuza
Fundokuhle	Pietermaritzburg	Imbali stage 2
Georgetown*	Pietermaritzburg	Edendale
Pata	Pietermaritzburg	Pata
MehlokaZulu	Pietermaritzburg	Imbali stage 2
Nyonithwele	Midlands	Edendale
Siqongweni	Pietermaritzburg	Imbali unit 13
Siyahlomula*	Midlands	Ashdown
Smero*	Midlands	Smero

FIGURE 1: A MAP OF GREATER EDENDALE SHOWING CASE STUDY SCHOOLS



2.2.2 QUESTIONNAIRE SURVEYS

Self-administered questionnaires were distributed to the principals of the 25 schools for completion by them and a total of 240 questionnaires (30 to each school) were distributed to 4 primary and 4 secondary schools to be filled in by pupils (Appendices 8 and 9).

Because of the English language problem faced by some pupils, their questionnaires were translated into Zulu. The 8 schools were selected in order to avoid using a sample of 25 schools as in the case of principals, because that would result in a big number of questionnaires, making it difficult for data analysis. There were also selected to test the views of pupils in 2 different grades in each school.

A questionnaire was given to Mr B Lurie of Damol-Lurie cc: Recyclers of Waste in Greater Edendale (Appendix 10). Interviews were conducted with Pietermaritzburg-Msunduzi Municipality (Waste Management Division Head, Mr R. L. Scanes), and Mr A Buthelezi, a refuse truck driver doing collection in Greater Edendale (Appendix 11), and Ms C Barrowman, Environmental Officer of the Keep Pietermaritzburg Clean Association (KPCA) (Appendix 12). Mondi Recycling, Nampak Paper Recycling and Sappi Waste Paper were interviewed telephonically (Appendix 13). This was done to avoid delays that could be caused by sending questionnaires through the post. Direct observations of waste generated at schools, as well as recyclable materials collected by pupils, were also used as methods of investigation.

3. RESULTS AND DISCUSSION

All of the 25 questionnaires distributed to school principals were returned completed. Of the 240 questionnaires distributed to pupils, 186 were completed, i.e. a 78% return. The translation of pupil questionnaires into Zulu helped in getting relevant and well stated responses, especially from those in the lower grades.

3.1 PERCEPTIONS OF WASTE MANAGEMENT BY SCHOOL PRINCIPALS

A comparison between primary and secondary schools shows that there is more dedication on the part of the primary schools to waste management through recycling. The majority of secondary schools from the sample survey are not interested in waste management through recycling (Table 3). This can be associated with the fact that environmental studies is only taught at primary levels of education. This causes diminishing interest in environmental issues with increasing level of education (Plate 5).

Table 3: Percentages of primary and secondary schools that are and are not practising recycling

Number of schools	% practising recycling	% not practising recycling
15 Primary	53	47
10 Secondary	10	90



Plate 5 Collection for recycling in one of the primary schools in Greater Edendale

The 15 primary schools have been more engaged in collection for recycling since 47% are involved in collecting tin cans, 33% in collecting plastics and paper, and 27% in collecting bottles/glass (Table 4). No primary schools collected metal. Of the 10 secondary schools that were surveyed 20% are involved in collecting tin cans, 10% in collecting plastics, paper and bottles/glass, and 10% in collecting metal. None collected cardboard. However, these data, analysed from the questionnaires completed by principals, may be biased. Direct observation by the researcher during visits to the schools revealed that all 10 secondary schools surveyed showed no signs of interest in collection for recycling.

Table 4: Percentages of primary and secondary schools involved in collection for recycling

Material	% primary schools	% secondary schools
Tin cans	47	20
Plastics	33	10
Paper	33	10
Bottles/Glass	27	10
Cardboard	20	Nil
Metal	Nil	10

In some residential areas of Edendale there is formal waste collection by the Municipality and this includes some of the sampled schools. The study showed that at 47% of the primary schools waste collection is by the Municipality and at 27% of primary schools waste collection is by private contractors. In the case of private contractors not all types of waste are collected but rather only selected items such as bottles and tin cans. For secondary schools 50% of them have waste collected by the Municipality and there is no private contractor (Table 5).

Table 5: Percentages of primary and secondary schools where waste collection is by Municipality or private contractor

Form of collection	% Primary schools	% Secondary schools
Municipality	47	50
Private contractor	27	Nil

The type and quantity of recyclable materials that are generated or collected at the sampled schools are given in Table 6.

Table 6: Nature and quantity of recyclable materials generated or collected by schools per week

Nature	Primary schools	Secondary schools
Tin cans	5 x 25 kg bags	1 x 25 kg bag
Plastics	5 x 25 kg bags	1 x 25 kg bag
Bottles	10 x 25 kg bags	Nil
Paper	11 x 25 kg bags	14 x 25 kg bags

The primary schools claimed that 40% of recyclable material is generated and collected within the school premises while 80% of secondary schools claimed recyclable material is generated and collected within the school premises. This huge difference in percentages between primary and secondary schools indicates that data from primary schools are more realistic as compared to the data from secondary schools, because primary schools are more directly involved in recycling projects. Motivation for primary schools to collect recyclable materials from the local community households, comes from a desire to promote a clean environment and from a desire to generate income for the school.

According to the survey of the 25 school principals, 87% of primary school principals consider that pupils are enthusiastic about collection of recyclable materials, while only 30% of secondary school principals feel that their pupils are enthusiastic. This latter result from secondary school principals further indicates why secondary schools are not involved in recycling projects.

Other projects that are done by primary schools which involve waste are mainly craftwork such as door mats and hats made from plastics, and candle stands, and other ornaments made from tin cans and bottles. They also use other materials to make teaching and learning aids. Secondary schools make no use of school waste in such projects.

Comparing the views of principals from primary and secondary schools an analysis of the questionnaire data reveals that 40% of primary schools receive rewards/incentives for collecting recyclable materials, compared to only 10% of secondary schools. These rewards/incentives are in monetary terms. For instance, when tin cans are collected by a school, they are sold to

“Collect a Can” which will, in turn, send them to recycling industries. These data again indicate that secondary schools are not involved in any waste management through recycling.

Analysis of the questionnaire data from the school principals reveals that 43% of primary schools use organic waste for composting; 23% dispose of organic waste in pits within the premises; 20% burn organic waste; 7% have their organic waste collected by the Municipality; and another 7% dispose of organic waste into skip bins. These skip bins are located near some of the schools. On the other hand, 45% of secondary schools burn organic waste; 30% have organic waste collected by the Municipality; and 25% have organic waste dumped into pits within the premises. These data show that secondary schools are not involved in any composting projects, because no schools' organic waste is used for composting.

Primary schools generated approximately 5 x 25 kg bags of organic waste per week, while secondary schools generated approximately 4 x 25 kg bags of organic waste per week. This result is at variance with the size of the school premises, because in most cases secondary schools are bigger than primary schools. Some secondary schools argue that they don't practise composting, because there are no vegetable gardens. Some admit that they never thought of getting involved in such a project.

The survey of school principals revealed that 67% of primary schools grow vegetable gardens, while no secondary schools grow vegetable gardens. Those principals of primary schools where vegetable gardens are not grown argue either that there is no space or that gardens are destroyed by domestic animals like cows and goats. This appears to be a weak argument, because from direct observation by the researcher during visits to the schools, all the surveyed schools are fenced. Some secondary school principals argued that they don't grow vegetable gardens because they do not offer agricultural science as a subject; and others do not have any genuine reasons.

The sample survey revealed that 53% of primary schools have a compost pit/heap within the premises and only 30% of secondary school have compost pits/heaps. This latter figure is contradictory, because results discussed above revealed that no secondary schools practise

composting. Primary schools that practise composting use some of the following materials to make compost:

- grass;
- paper;
- scraps of fruits and vegetables;
- bones;
- leaves;
- kraal manure;
- twigs; and
- food remnants.

All the primary school principals surveyed indicated that they are willing to be involved in composting projects, because they believe they will help children to understand cheaper methods of improving soil fertility. Composting projects, according to primary school principals, can also help pupils to have the capacity to make compost at their homes and to encourage them to love a clean and beautiful environment. Data from secondary school principals reveal that 50% would like to be involved in composting projects, because that can help pupils to practise practical agriculture. They also argued that pupils could spread the idea of composting within their communities.

3.2 PERCEPTIONS OF WASTE MANAGEMENT BY SCHOOL PUPILS

The age groups of primary and secondary school pupils in grade 6 (std 4), grade 7 (std 5), grade 8 (std 6) and grade 11 (std 9) are given in Table 7.

Table 7: Age groups of primary and secondary school pupils and the percentage who completed and returned questionnaires.

Age group	Primary school %	Secondary school %
6 - 10	2%	-
11 - 15	95%	33%
16 - 20	3%	55%
21 - 25	-	12%

The majority of primary school pupils in grades 6 and 7 fall within age group 11-15 years, while the majority of secondary school pupils in grades 8 and 11 fall within the age group 16-20. These age groups can serve as a yardstick to measure the effects of age in gaining or losing interest in waste management.

According to the survey, 74% of primary school pupils had been taught in one way or another about waste management and recycling. Only 43% of secondary school pupils acknowledged that they had been taught about waste management and recycling.

The survey revealed that 81% of primary school pupils do not encounter problems when collecting recyclable materials outside school premises; secondary school pupils did not respond to the question. It is assumed that they did not respond because they are not involved either in collecting recyclable materials or in recycling projects. Those primary school pupils who said that they did encounter problems listed the following reasons:

- they are cut by broken bottles;
- they are discouraged by some community members who referred to them as “the poor”

and as “the lunatics”; and

- they come across items that can cause infectious diseases, such as used syringes.

Of the primary school pupils who responded to the question, 45% said they receive rewards or incentives for collecting recyclable materials. Only 6% of secondary school pupils said they receive rewards or incentives for collecting recyclable materials. The information given by school principals was that 40% of primary schools and 10% of secondary schools receive rewards or incentives (see above). These data reveal that pupils might not have information about the rewards/incentives received by the school. It appears that this might only be known to the principal or to the teacher involved in collection for recycling. The data analysed from the questionnaires completed by pupils show that the rewards/incentives are in the form of money; T- shirts; caps; sports equipments; computers; trophies; certificates; and photocopiers.

Although some schools don't have lawns, playing fields, vegetable or flower gardens others do even though some are small. According to the sample survey the following are the organic materials that pupils saw as being generated at their schools:

- weeds and alien plants;
- vegetable and fruit scraps;
- grass clippings; and
- leaves from trees;

According to the information from primary school pupils, 67% claim that their schools are involved in composting in one way or another; only 15% of secondary school pupils claim that their schools are involved in composting projects. There again appears to be bias as far as the 15% of secondary school pupils that claimed that their schools practise composting, because from direct observation no secondary schools in the sample survey have compost pits/heaps. Gardening as a subject is not in the curriculum for secondary schools, and this also contributes to secondary schools not being active in composting projects. Those secondary schools where agricultural science is taught as a subject do not do the practical part of the subject. This is a major problem in the schools in Edendale and indeed in the so-called “black schools” in general.

According to the sample survey, 99% of primary school pupils, and 94% of secondary school pupils are willing to be involved in composting projects. This reveals the fact that if pupils can be introduced to the concept of composting and can be made aware of the value of composting and be guided by their teachers they will co-operate. This also shows that children are the ones that can bring back a love for the environment. Those pupils who say they are not interested in composting say compost heaps/pits bring bad odour. From this statement it is deduced that some of the pupils have not been exposed to proper composting. Bad odour means that the compost is not cared for properly (Appendices 3, 4, 5 and 6). They also argue that their schools have insufficient space, and some argue that compost can cause untidiness at schools. Some said that they do not have gardens and that there is no time for doing gardening. Pupils that are willing to be involved in composting projects have the following reasons:

- Compost can be sold to raise school funds;
- Composting can promote cleanliness within the school premises;
- Composting can promote competition among schools;
- Composting goes hand in hand with the growing of vegetable and flower gardens;
- Compost is the cheap method of enriching the soil; and
- Composting is part of education.

The survey showed that all primary and secondary school pupils have never come across any composting project in their residential areas. This may be because composting is a new concept to people in Greater Edendale. From some of the pupil responses it is deduced that there is a misconception about various methods of composting. Some pupils view simply disposing of organic waste in the garden as composting.

The survey revealed that 58% of primary school pupils are taught at school about the three R's (the concept of Reducing, Reusing and Recycling of waste), while 41% of secondary school pupils claimed that they are taught at school about this concept. This may be a result of the fact that the curriculum is designed in such a way that environmental education is more emphasised at primary level than at secondary level. Although some pupils claimed that they are taught at school about the concept of reducing, reusing and recycling, they were unable to explain it. From

their responses it is deduced that they know that they collect cans, papers and plastics for recycling, but they don't clearly understand the concept of recycling.

The sample survey showed that 52% of primary school pupils and only 15% of secondary school pupils see the waste dumping site as a resource; the rest see it as a source of pollution. Those who see it as a resource argued that poor and needy people explore the dumping sites and find things that can be useful to them. They also said that dumping sites are the places where recyclable materials can be found. Those pupils who see the dumping site as the source of pollution argued that wind blows papers which in turn pollute land and water. They also argued that people living near dumping sites are vulnerable to diseases and that they are affected by bad odour and flies.

3.3 THE ATTITUDE OF THE MUNICIPALITY TO USING SCHOOLS IN WASTE MANAGEMENT

The local Municipality has a Waste Management Division which is involved in refuse collection in Greater Edendale. This Division carries out the collection of school refuse, which includes all the sampled schools that follow the instructions from the Division that they should take their waste to the side of the road that is close to the school, because the Division does not collect refuse directly from the school premises (Figure 2). Not all schools are served by this Division because some schools are not accessible and some do not take out their refuse to the street so that the refuse truck can collect. The Waste Management Division conducted a survey in June 1997 to determine the likely contribution of schools to the amount of refuse to be collected. The objectives of the survey were as follows:

- to determine the current refuse generation;
- to determine the methods used to deal with generated refuse; and
- to find a solution as suggested by the schools with regards to waste removal.

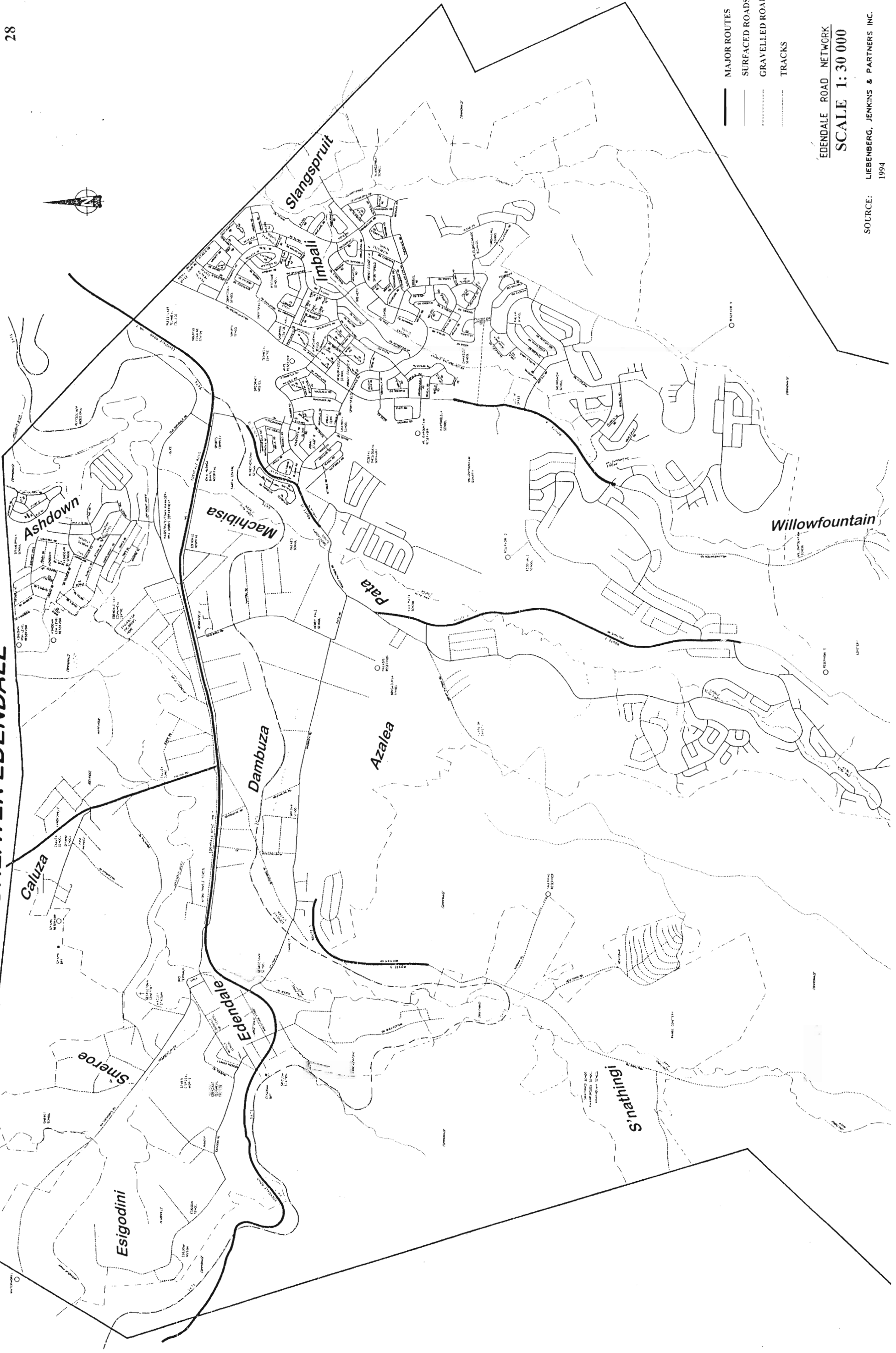
The Water Management Division survey showed that about 80% of the schools have their own ways to deal with generated refuse, and the remaining 20% is being served by either Edendale

Depot or Doull Road Depot trucks. The unserved Edendale schools are mostly burning their refuse (which is mostly paper) at a chosen spot (normally a pit). The Municipality survey found problems caused by the burning of waste. These problems included the following:

- the pit will have to be dug out regularly (changing spots sometimes);
- they have to wait for the right weather;
- when burning, air pollution is inevitable;
- on a windy day some papers will spread out again; and
- refuse that does not burn will eventually become a major problem as this will be accumulating every week.

As far as collection from schools is concerned the Waste Management Division find no problems, because those schools which do not take out their refuse to the nearby streets have to solve the problem for themselves. The Division has no educational programmes that can help school pupils to be able to handle and manage waste properly. At the moment there are no plans for the Waste Management Division to use schools for inculcating a culture of household waste management and a cleaner environment. It was only towards the end of 1998, whereby an R84 000 city clean-up initiative by the KPCA and the Municipality's Waste Management Division was launched by the chair-person of the TLC Executive Committee. The Scheme is a pilot project to utilise the services of up to 66 school pupils to help keep the city clean over the holiday season. Some of the pupils are envisaged to come from some of the schools in Greater Edendale including Mehlokazulu and Siqongweni which are part of this case study (Albridge, 1998). This initiative is a campaign to make pupils understand that this is the start of an educational campaign to help persuade everyone not to litter. From the Waste Management Division point of view private contractors, especially those who collect food remnants from schools, should be encouraged to do so, so that disposal to landfills can be minimised (Albridge, 1998).

FIGURE 2
GREATER EDENDALE



- MAJOR ROUTES
- SURFACED ROADS
- GRAVELLED ROAD
- TRACKS

EDENDALE ROAD NETWORK
 SCALE 1:30 000

SOURCE: LIEBENBERG, JENKINS & PARTNERS INC.
 1994

3.4 KWAZULU-NATAL'S RECYCLING INDUSTRIES ATTITUDES TOWARD USING SCHOOLS AS MINI DEPOTS FOR COLLECTION OF RECYCLABLE MATERIALS

There is a recycling agent by the name of Damol-Lurie cc: Recyclers of Waste in Greater Edendale. Damol-Lurie is involved with collecting recyclable materials from schools. These materials include the following:

- ✘ cardboard;
- ✘ mixed waste paper;
- ✘ newspapers;
- ✘ magazines ; and
- ✘ scrap metal.

These materials are taken to various recycling industries in KwaZulu-Natal, although the official interviewed would not give the names of these industries, stating that it is confidential. Although collection is done from schools by Damol-Lurie of Waste there are problems that exist regarding the collection such as the burning of the containers at some educational institutions in Greater Edendale.

When recyclable waste is collected and taken to Damol-Lurie of Waste by the schools themselves, there are prices given for them. This acts as an incentive for the schools to collect more cans for example. Damol-Lurie is willing to support a move to approach the KZN Department of Education and Culture to ask to use schools as “mini depots” for collection of recyclable materials.

Other paper recycling companies, like Mondi, are involved in collecting recyclable paper at schools, but they are not dealing with schools in Greater Edendale. They collect only from schools in central Pietermaritzburg. Generally, recycling companies are not concentrating on schools in peri-urban areas like Greater Edendale. One of the reasons is assumed to be security, since in 1996 one of the containers located at Indumiso College of Education was burnt by students during class boycotts. Communication break down is also assumed as one of the

reasons.

The Keep Pietermaritzburg Clean Association (KPCA), an organisation based in Pietermaritzburg, have come up with the Environmental Award System for Youth (the “EASY” programme) which aims to encourage waste management in schools in the Greater Pietermaritzburg-Msunduzi TLC. The “EASY” programme is an environmental education package developed by the KPCA Education Sub-Committee, that aims to promote environmental awareness at primary school level. This programme consists of information in a manual form for use by teachers. The manual offers activities for the class to perform in order to earn points, which are indicated on a board placed outside the school. There is reference to various topics, which, linked with the wide choice of activities, ensures that pupils “learn by doing”. These topics include the following:

- recycling, where general information on recycling as well as up to date details on recycling agents in Pietermaritzburg is provided;
- gardening with waste, where information is provided on trench gardening which is considered ideal because bio-degradable waste material is used to grow healthy vegetables and can thus be disposed of in this manner; and
- clean-up campaigns that form part of long term education programmes undertaken by groups.

Some of the primary schools that are part of the case study are involved in the “EASY” programme (Table 8). A school that has scored 50 points receives one green elephant sticker. If the school has received four green elephant stickers it is awarded with a gold elephant sticker. All these stickers are put on the sign board. At the end of the year the school that has obtained the highest points is awarded a floating trophy and a certificate.

Table 8 1998 EASY PROGRAMME BY KPCA

EASY PROGRAMME 1998

	SCHOOL	NO. OF PUPILS	POINTS	HAVE ELE'S	NEED ELE'S	HAVE SIGN
1	BISLEY PARK PRIMARY	692	0			
2	BOOMERS PRE PRIMARY	50	370	2 green	1Gold+2G	Y
3	CALUZA PRIMARY	500	430		1Gold+3G	Y
4	CLARENDON PRIMARY	600	395	1 GOLD	2 Green	Y
5	EASTWOOD PRIMARY	1329	10			Y
6	EDENDALE PUBLIC PRIMARY	800	0			Y
7	ESIGODINI PUBLIC PRIMARY	320	85	1 green		
8	FEZOKUHLE PUBLIC PRIMARY	1121	620	2 gold	2 Green	
9	FUNULWAZI LOWER PRIMARY	800	210	4 green		Y
10	GATEWAY CHRISTIAN SCHOOL	125	40			
11	GRANGE PRIMARY	910	330	1 GOLD	1 Green	
12	HAZELWOOD PRE PRIMARY	120	70		1 Green	Y
13	HERITAGE ACADEMY	190	30			
14	HLELINGOMUSO PUBLIC PRIMARY	700	0			Y
15	KHWEZI PRIMARY	460	30			Y
16	KWA-MPUNGOSE PRIMARY	486	20			Y
17	LADDSWORTH PRIMARY	463	135			
18	MERCHISTON PREPARATORY	570	45			Y
19	MERRYLAND PLAYCENTRE	120	45			
20	MIGHTY MOUSE PRE PRIMARY	34	50			Y
21	MOUNTAIN RISE PRIMARY	630	0			Y
22	MPUMELELO PRIMARY	540	0			Y
23	MTHETHOMUSHA PRIMARY	900	45			
24	MYEZANE PUBLIC PRIMARY	320	0			Y
25	NEWTON HIGH	450	45			Y
26	NICHOLS PRIMARY	1014	460		1 Go + 4 g	Y
27	PANORAMA PRIMARY	698	0			
28	PELHAM SENIOR PRIMARY	670	85	1 GREEN		Y
29	PIED PIPER PRE PRIMARY	68	0			
30	PRINCE ALFRED PRIMARY	250	997	2 GOLD	1 GOLD	Y
31	RAINBOW NATION PRE SCHOOL	20	0			Y
32	RAMATHA ROAD PRIMARY	755	40			Y
33	RANGRAGE PRE PRIMARY	30	65			Y
34	RUSSELS PRIMARY	738	0			
35	SCOTTSVILLE SENIOR PRIMARY	950	25			
36	SHRI VISHNU PRIMARY	220	190			Y
37	SIYAMU PRIMARY	840	0			Y
38	SOS KINDERGARTEN	40	205	2 green		Y
39	ST CHARLES COLLEGE	400	0			
40	ST NICHOLAS DIOCESAN	270	295	2 GREEN		Y
41	SUNNYLEA PRE PRIMARY	108	80			Y
42	TPA PRIMARY	670	160			Y
43	THE WYKEHAM COLLEGIATE	320	25			
	TOTALS	21291	5632			

4. CONCLUSIONS AND RECOMMENDATIONS

Pupils should be taught proper ways of making compost. Because there is biological activity that takes place in the process of composting, pupils may develop some interest and love of microbes. Gardening is still in the new curriculum designed for post-apartheid pupils, and so it is recommended that teachers should be determined and teach the subject in the proper way. There is an unsound tendency for other teachers to undermine gardening teachers. This must come to an end, because the subject is the basis for our survival and sustainable development. Composting is practised even in developed countries. Seifert (1962) stated that domestic refuse has been composted in Britain, Holland, North Italy and Denmark and other countries for some years now, and the compost is eagerly acquired by farmers and gardeners.

It seems rather strange to teach environmental education at primary level and to stop when the pupils enter the secondary level of education. At tertiary level it is again emphasised. There is no good reason for this break at the secondary level of education. It is recommended that environmental education be in the curriculum throughout. South Africa is in a period of transformation and there is a lot of development that must take place. This development depends on space availability which is the physical environment. If the pupils are not taught at school about the vulnerability of the environment to development, sustainable development will be impossible. Pupils need to be taught about ways of preventing environmental degradation, so that future generations will also benefit from the environment. Thus the Minister of Traditional and Environmental Affairs in his opening address at the Local Agenda 21 Conference on 26 June 1997, argued that "A primary aim of environmental education is empowering people, the citizens of KwaZulu-Natal, to make informed choices about their daily activities and the impact that their activities have on the environment."

Background documentation on the Local Agenda 21 Conference in Durban: 26 June 1997 emphasised the point that the concept of urban agriculture (food gardens) based on sustainable farming methods (recycling of waste material for compost and fertiliser in food gardens) could also play a major role in preventing settlements in areas below the flood line, and should be encouraged. This reveals the fact that waste management through composting will not only

benefit the soil as a plant growing medium, but it will also protect flood line areas from being invaded by informal settlement, through the growing of gardens along the river banks, which is a spin-off of composting projects. Urban agriculture will be futile if the soil is not retained and improved. The most prevalent form of urban agriculture is that of subsistence food production, predominantly practised by the poor. For this reason, economic ways of making the soil more fertile should be taught to these people. The best way to teach the people about these economic ways is to introduce composting at primary schools. Pupils will, in turn, teach their parents about how to make compost. Claude and Msaai (1989) recommended that school curricula should be radically revised to teach relevant topics like basic nutrition, agriculture, accounting and environmental science, so that from a very early age all children become aware, not only of the major issues which confront planet earth, but also some of the directions which need to be followed in order to solve them. Some more directly available activities might include waste management through composting which is an important component of agriculture. Community composting can contribute to their well-being by promoting a cleaner environment and community solidarity.

It would seem, therefore, that the implementation of waste management with special emphasis on composting in primary schools in Greater Edendale is feasible. But to implement waste management at secondary schools will require intensive education of the pupils as well as teachers about the value of composting and agriculture in general. It has been found that secondary schools in Greater Edendale are less involved in waste management. Although some secondary school pupils are aware, they lack motivation. Organisations such as the Greater Edendale Environment Network should be encouraged to establish educational programmes to help to motivate and make pupils aware of the value of waste management and composting. Schools should be extensively used to educate children about waste management and composting in order to spread these activities within the different communities of Greater Edendale. Children should be encouraged to separate refuse waste for recycling and composting using incentives such as monetary rewards for the pupils who have achieved separation and composting up to a required standard.

Recycling industries in KwaZulu-Natal, especially for paper and tin cans, should also target

primary and secondary schools for collection rather than only focusing on tertiary institutions. If this is done pupils will gradually become aware of the concept and value of recycling. Lund (1993) stated that recycling occurs for three basic reasons: altruistic reasons, economic imperatives, and legal considerations. In the first instance, protecting the environment and conserving resources have become self-evident as being in everyone's general interest. Second, the avoided cost of environmentally acceptable disposal of waste has risen to a level where when combined with the costs associated with recycling, it now makes economic sense to recycle many materials. Finally, in responding to both public demand and a growing lack of alternative waste disposal methods, government is requiring recycling and providing for a wide variety of economic and civil penalties and incentives in order to encourage recycling.

School waste should be managed properly since there are chemicals that are used in laboratories that may be hazardous if not properly handled. Hartman (1990) argued that waste in academic institutions is not managed properly, because large quantities of chemicals are ordered without checking the stock. He found that new bottles are opened before others are used up. This mismanagement can result in bottles being disposed of with remnants of chemicals that can be hazardous.

In addition, the collection and delivery of plastics to designated supermarket bins or containers at garden refuse sites and schools should also be encouraged. Households should buy products containing recycled plastics. By this means the market for recycled plastics will be expanded and the economic viability of plastic recycling will be increased.

Through the involvement of schools in waste management the public can be educated more to the role of responsible waste disposal and management. Waste management is an issue to be dealt with in a proactive manner if the expected growth of industry and the projected population growth for the future is taken into consideration. Effective and safe waste management is fundamentally important for maintenance of a sustainable global population and, also, a desirable quality of life within the framework of global societies. (Jolley and Wang, 1993). Because facilities available at present are hardly able to cope with the waste generated, appropriate waste minimisation techniques should be employed. These techniques should include simple ways of waste minimisation, such as recycling, and composting of organic waste. From an education

point of view, the relevant authorities such as the Departments of Water Affairs, Environmental Affairs and Tourism, and Education and Culture, in collaboration with private companies should work together to formulate waste management education policies to be implemented in schools.

REFERENCES

- Albridge, B. (1998) Pupils to be paid to pick up litter, The Natal Witness, Pietermaritzburg: The Natal Witness
- Ball, J. M. (1994) Minimum Requirements for Waste Disposal by Landfill, Department of Water Affairs and Forestry, Pretoria.
- Carless, J. (1992) Taking Out The Trash: A No-Nonsense Guide to Recycling, Island Press, Washington D.C..
- Claude D. J. and Msaai, M. (1989) ASPECTS OF CITY SPATIAL STRUCTURE: A Paper presented on 10 February 1989 at the School of Architecture, University of Natal, Durban.
- Department of Environmental Affairs and Tourism (1996) Green Paper on An Environmental Policy for South Africa, Pretoria, Department of Environmental Affairs and Tourism.
- Fourie, L. (1997) 'Towards a better environment', New Horizons, vol. 3, No 2, 4.
- Gore, A. (1997) 'Respect the land', Time Magazine.
- GVRD Compost Resource Manual (1993) Creating Our Future: Steps To A More Livable Region, British Columbia.
- Hartman, I. S. (1990) Waste Disposal in Academic Laboratory: Headaches and Solutions, Waste Disposal in Academic Institutions, Lewis Publishers Inc, New York.
- Jolley, R. L and Wang, R. G. M. (1993) Effective and Safe Waste Management: Interfacing Sciences and Engineering with Monitoring and Risk Analysis, Lewis Publishers, Florida.

- Lardinois, I. (1993) Organic Waste Options for small-scale Resource Recovery, Tool, Amsterdam.
- Local Agenda 21 Conference (1997) KwaZulu-Natal: Local Agenda 21 Information Package. Background document
- Local Agenda 21 Conference (1997) Transcript of the speeches of Minister NJ Ngubane and Minister PM Miller
- Lombard, R. (1994) A report on PAPER RECYCLING in South Africa, CapeTown: Department of Environmental Affairs and Tourism (DEAT).
- Lund, H. F. (1993) THE McGRAW-HILL RECYCLING HANDBOOK, New York:
- McLean, M. (1997) Waste not, want not: Reduce, reuse and recycle... the three Rs for a better place to live, University of Natal Focus, vol. 8, N° 1, 19.
- Myburgh, J. (1991) Once is not enough, Argus Newspapers Ltd, Johannesburg.
- Schliemann, G. K. (1980) Compost on the farm, Department of Agriculture and Fisheries, Research Institute for Fruit and Fruit Technology, Stellenbosch.
- Seifert, A. (1962) COMPOST, FABER AND FABER, London.
- The Kindred Association (1994) A practical recycling hand book, Thomas Telford, London.
- The Natal Witness (1996) Recycling in South Africa, The Natal Witness, The Natal Witness, Pietermaritzburg.
- Van Vuuren, J. P. J. (1949) Soil Fertility and Sewage, Faber & Faber, London.

APPENDIX 1

MINIMUM REQUIREMENTS FOR WASTE DISPOSAL BY LANDFILL (Ball, 1994)

The Department of Water Affairs and Forestry, in whom responsibility for waste disposal is vested, has embarked on a programme to meet both current and future waste disposal needs. The programme is aimed at protecting the public and the environment from the impacts of bad waste management. This will be achieved by establishing and maintaining standards for waste management, in the form of minimum requirements which are applicable nationwide. Minimum Requirements are standards which differentiate waste disposal practices that are environmentally and publicly acceptable from those that are not. The aim is to provide affordable environmental protection. This is done by applying graded Minimum Requirements to different classes of landfills. Landfills are therefore classified according to size of operation, waste type and potential for significant leachate generation. Where significant leachate is generated, leachate management is mandatory and where hazardous waste is involved, the most stringent Minimum Requirements are applicable. Good landfill site selection provides for simple cost-effective design, which, provided the site preparation is correctly carried out, provides for good landfill operation. This in turn ensures the environmental acceptability of the landfill. Environmental acceptability, in its turn, often relates directly to public acceptability.

Minimum Requirements are for all technical aspects of landfill development, operation and closure. However in accordance with the integrated Environmental Management approach, adopted throughout, Minimum Requirements are also set for involving the public and the “Interested” and “Affected Parties” in determining site feasibility and end-use requirements of a landfill site. The Integrated Environmental Management Approach also includes an Environmental Impact Assessment, and this, together with other necessary stages in the landfill development process, forms part of the Landfill Permit System.

It is by means of this Landfill Permit System, instituted in terms of the Environment Conservation Act (Section 20 of Act No. 73 of 1989), that the Minimum Requirements are implemented and enforced. The Act states that “no person shall establish, provide or operate any

disposal site without a permit issued by the Minister of Water Affairs & Forestry and subject to the conditions contained in such a permit". This applies to all new and operating sites. Unpermitted closed sites may be controlled either in terms of Section 31A of the Environment Conservation Act of 1989 or in terms of section 22A of the Water Act of 1956 (Act No. 56 of 1956). The Permit holder is ultimately responsible and accountable for the landfill and any effect it may have on the receiving environment. However, he may appoint a Responsible Person, for example, a consultant or operator, to ensure that the appropriate Minimum Requirements are applied throughout the development, operation and closure of the landfill.

Minimum Requirements for Waste Disposal by Landfill criteria are established for the selection, permitting, investigation, design preparation, operation, closure and monitoring of waste disposal facilities. The intention of the Minimum Requirements for Waste Disposal by Landfill project is to provide legislators, consultants, Permit Applicants and Permit Holders with guidelines and with practical information that will assist them in complying with Department's policy and with any associated legislative requirements.

The following are the objectives of the Minimum Requirements for Waste Disposal by Landfill:

- To improve the standard of waste disposal in South Africa;
- To provide guidelines for environmentally acceptable waste disposal for a spectrum of landfill sizes; and
- To provide a framework of minimum waste disposal standards within which to work and upon which to build.

APPENDIX 2

A LETTER ACCOMPANYING POSTERS

1

Date :

THE PRINCIPAL
FEZOKUHLA PRIMARY SCHOOL



UNIVERSITY OF NATAL
 Pietermaritzburg

Department of Agronomy
 Crop Science, Soil Science and Agrometerology

Private Bag X01 Scottsville
 Pietermaritzburg 3209 South Africa
 Telephone: (0331) 260 5911
 Direct Line: (0331) 260 5415
 Fax: (0331) 260 5426
 Telegrams University Telex 643719

Dear Sir/Madam

RE: COMPOSTING PROJECT

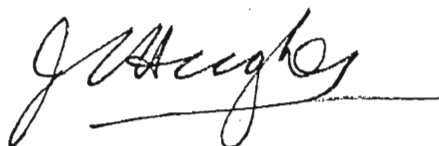
Thank you for your school's participation in a case study, whereby the Principals and pupils of schools in Greater Edendale were asked to fill in questionnaires on waste management with a special emphasis on composting. The questionnaires were distributed in August 1997 to 15 Senior Primary and 10 Secondary schools.

A good return of the questionnaires from your school shows that your school is committed to composting projects. The Department of Agronomy would therefore like to present your school with one of the composting posters. These posters were designed and printed by Alistair Nixon from Audio-Visual Centre in conjunction with Professor Jeff Hughes from the Department of Agronomy and Felix Nxumalo a Masters student from the School of Environment and Development, all at the University of Natal, Pietermaritzburg. This is the first of four such posters and you will receive the rest as they become available. We hope you will find them useful in your teaching and we would be happy to answer any questions you may have.

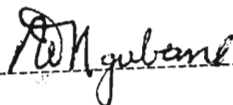
We would also like to inform you that your school has been selected, if you are willing, to be one of the six schools that the University will be working with on composting projects in the near future. Your co-operation again in this regard will be highly appreciated. Kindly acknowledge receipt of the poster on the copy of this letter by endorsing your signature and school stamp in the spaces provided below.

Looking forward to working together with your school in the near future.

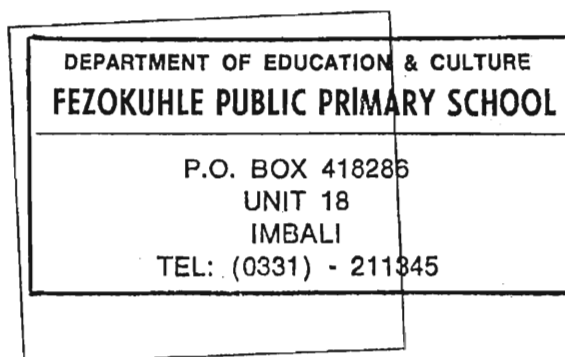
Yours faithfully



J C Hughes
Professor
Soil Science

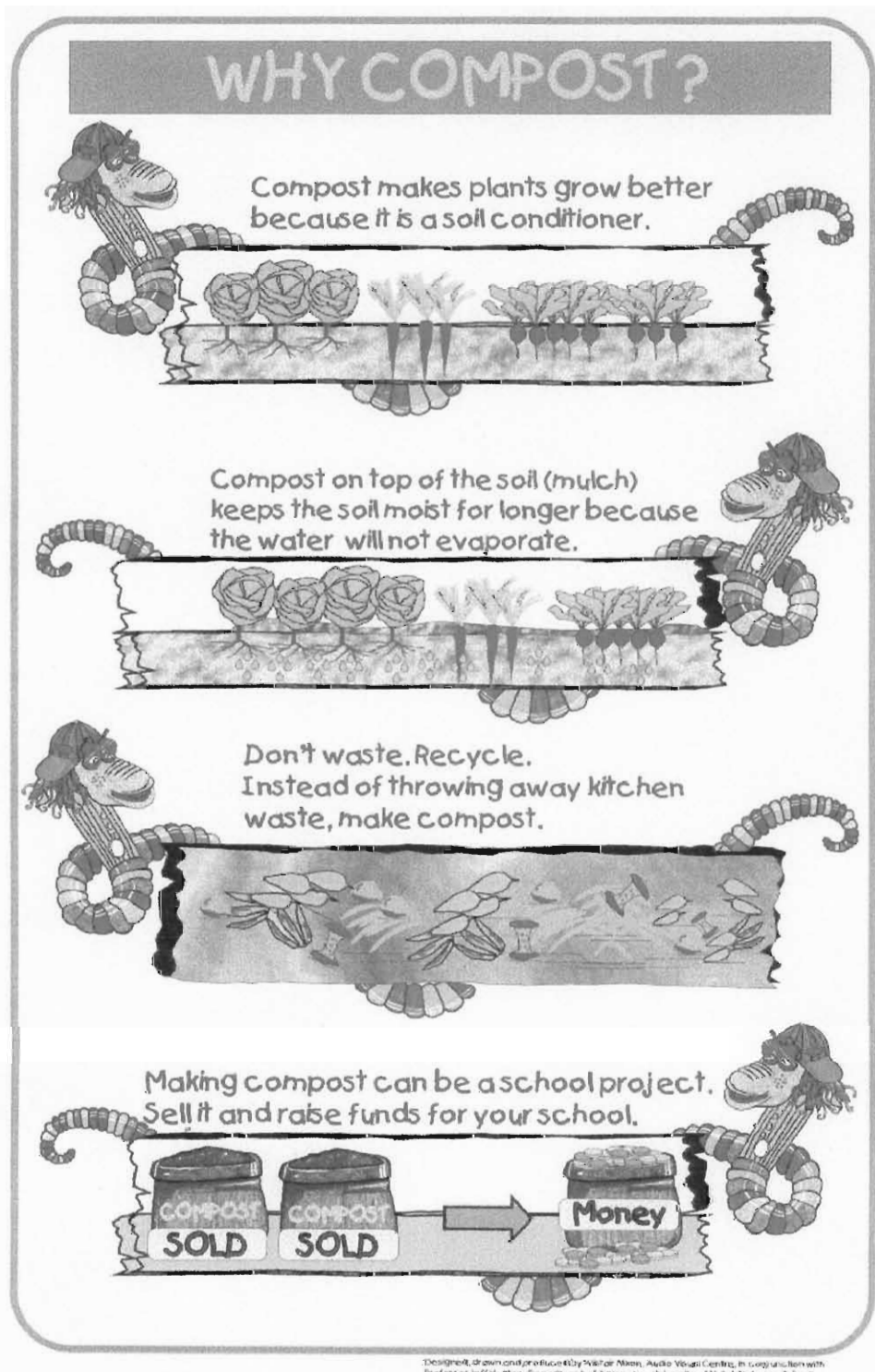
Principal/Teacher in charge signature 

School stamp



APPENDIX 3

A SAMPLE OF ONE OF THE POSTERS DISTRIBUTED TO SCHOOLS IN GREATER EDENDALE



APPENDIX 4

WASTE MANAGEMENT QUESTIONNAIRE (Principals)

This questionnaire is anonymous and no school's, teacher's or pupil's name need be given. Please feel free to fill in this questionnaire with confidence and make sure that the information you give truly reflects the real situation you are in or that you know. Where there is a choice, please tick the box next to the option you prefer.

1. Type of school: Primary Secondary

2. Does your school practice any waste recycling management? Yes No If yes how?

3. Is your school involved in separation or collection of the following for recycling? Please tick.

tin cans <input type="checkbox"/>	bottles/glass <input type="checkbox"/>
plastics <input type="checkbox"/>	cardboard <input type="checkbox"/>
recycled paper <input type="checkbox"/>	scrap metal <input type="checkbox"/>
other specify <input type="checkbox"/>	

4. Who removes the waste from your school? Please tick

Municipality <input type="checkbox"/>
Private contractor <input type="checkbox"/>
other <input type="checkbox"/> Specify

5. Where is the school's waste material taken to?

6. How much of the following does the school collect per month, e.g. 1 x 25 kg bag, 1 x litter bin or 1 drum:

Tin cans _____ Glass/Bottles _____ Paper _____ Metal _____ Plastics Other
specify

7. Do the above materials come only from within the school premises? Yes No If no
where do they come from?
8. If come from outside the school premises, what is the motive behind collecting materials
from the local communities households
9. From what you see or hear, are pupils enthusiastic about collection of recyclable
material?
Yes No
10. What other projects does your school do using tin cans, bottles, plastics, papers etc.
.....
11. Are there any rewards or incentives that are received by the school for collecting
recyclable materials? Yes No If yes what are they
12. How many refuse bags/litter bins of waste (other than organic waste) are generated by
the school per week?
13. How does your school dispose of organic waste?
14. How many refuse bags/litter bins of organic waste are generated in your school per week?
.....
15. Does your school practise composting? Yes No If No why?
16. Does your school grow vegetable garden? Yes No If No Why?
-
17. Is there any compost pit/heap in your school? Yes No If No why?
- If Yes Which material is used to make it?
18. Would you like your school to be involved in composting projects? Yes No
- If No why?
- If Yes Why?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION

APPENDIX 5

WASTE MANAGEMENT QUESTIONNAIRE (School Pupils)

This questionnaire is anonymous and no school's, teacher's or pupil's name need be given. Please feel free to fill in this questionnaire with confidence and make sure that the information you give truly reflects the real situation you are in or that you know. Where there is a choice, please tick the box next to the option you prefer.

1. Age ____ Male Female
2. What standard are you in? ____
3. Have you ever been taught about waste recycling management? Yes No
4. Does your school practice any waste recycling management? Yes No Don't know If yes how?
5. Do you encounter any problems when doing collection outside school premises Yes No If Yes what are those problems?
6. Are there any rewards or incentives that you receive for collecting recyclable materials? Yes No If yes what are they?
7. What organic waste material is generated at your school?
8. Does your school practise composting? Yes No If No why?
9. Would you like your school to be involved in composting projects? Yes No If No why?
If Yes Why?

10. Are there any composting projects that you know about in your residential area? Yes

No If Yes what are they?

Where are they located?

11. Have you ever been taught at school about the ways of reducing, reusing and recycling waste that is generated at home or at school? Yes No If yes what is to reduce, reuse and

recycle?

.....

12. Do you see a waste dumping site as a resource or as a source of pollution?

Why?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION

APPENDIX 5 cont. ZULU VERSION

INHLELO MBUZO NGOKUNAKEKELWA KUKADOTI: Izingane zesikole

Kunesiqiniseko sokuthi lenhlelo mbuzo ngeke iveze noma idinge igama lesikole, likathisha noma lomfundi. Uyacelwa ukuba ukhululeke ukugwalisa lenhlolo mbuzo ngesibindi nokuthi wenze isiqiniseko ukuthi ulwazi olunikezayo luveza isimo okusona noma osaziyo njengoba sinjalo. Lapho kudingeka ukuba ukhethe impendulo ehambisana nawe uyacelwa ukuba usebenzise loluphawu ✓ ebhokisaneni eliqondene nempendulo ohambisana nayo.

1. Iminyaka yakho___Ubulili bakho: Isilisa Isimame
2. usiphi isigaba esikoleni?_____
3. gabe usake wafundiswa ngokuphinda kusetshenziswe kukadoti njengenye yezindlela ezisetshenziselwa ukunakekela udoti? Yebo Cha Uma uthi yebo chaza ukuthi kanjani?
4. ngabe isikole sakho siyazisebenzisa izindlela ezithize zokunakekelwa kukadoti? Njengokuthi nje kuphindwe kusetshenziswe udoti. Yebo Cha Angazi Uma uthi yebo chaza ukuthi kanjani?
5. Kungabe zikhona yini izinkinga enihlangabezana nazo uma niqoqa amakopi ngaphandle kwesikole? Yebo Cha Uma uthi yebo kungabe yiziphi lezo zinkinga?
6. Kungabe ikhona inkokhelo eniyitholayo esikoleni ngokuqoqa izinto ezifana namakopi namabhodlela nokunye nokunye? Yebo Cha Uma uthi yebo kungabe ninikwani?
7. Iyiphi inhlobo kadoti omilayo okhiqizwa isikole sakho?
8. Kungabe isikole sakho siyayenza ikhomposti Yebo Cha Uma ingenziwa

ikhomposti? Chaza ukuthi kungabe sikhona yini isizathu.

9. Ungathanda ukuba isikole senu sibandakanyeke ezinhlelweni zokwenziwa
 kwekhomposti?

Yebo Cha

Uma uthi 'cha' kungabe yini ungathandi?

Uma uthi 'yebo' kungabe yini uthande?

10. Kungabe zikhona ezinye izinhlelo zekhomposti ezenziwayo emphakathini wangakini?

Yebo Cha Uma uthi 'yebo' kungabe yizinhlelo ezinjani?

lezi zinhlelo zekhomposti zenzelwa kuphi nendawo?

11. Usake wafundiswa esikoleni ngezindlela ezithile zokunciphisa udoti, zokuphinda
 sisebenzise esikuthatha njengodoti nokuphinda kugaywe ngenhloso yokuphinda

kusetshenziswe udoti? Yebo Cha Uma uthi yebo chaza ukuthi ukwenze njani
 ukunciphisa, ukuphinda sisebenzise nokuphinda kugaywe udoti?

12. Kungabe indawo okulahlwa kuyo udoti emphakathin wangakini uyibona njenge ndawo
 engaba yindawo lapho abanye abantu bengathola khona izinto ezingaba wusizo, noma
 uyibona njenge ndawo eletha ukungcola endaweni?

Yini ubone kanjalo?

UYABONGWA NGOKUTHATHA ISIKHATHI SAKHO UZIBANDAKANYE
 EKUPHENDULENI LEMIBUZO.

APPENDIX 6

WASTE MANAGEMENT QUESTIONNAIRE (Damol-Lurie cc: Recyclers of Waste)

This questionnaire is anonymous and no respondent's name need be given. Please feel free to fill in this questionnaire with confidence and make sure that the information you give truly reflects the real situation you are in or that you know. Where there is a choice, please tick the box next to the option you prefer.

1. What types of recyclable materials are collected by the company? Please list them.
.....
2. Please list the companies to which these materials are taken to respectively.
.....
3. Do you collect recyclable materials from schools in greater Edendale? Yes No
If yes please list the names of the schools from where collection is done
.....
4. Do you encounter any problems when collecting recyclable materials from schools?
Yes No If yes what are those problems?
5. How are the schools cooperation with regards to the collection of recyclable materials from their premises?
6. Are there any rewards/incentives that you give to schools for collecting recyclable materials from their premises? Yes No If yes what are they?
7. Approximately how much recyclable materials are collected from all schools in greater Edendale per month
8. Does the company benefit from collecting recyclable materials from schools Yes No
If no why?
9. Would the company support a move to approach the Department of Education and Culture to ask for using the schools as "mini depot" for collection of recyclable materials by recycling industries? Yes No If no why?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION

APPENDIX 7**INTERVIEW QUESTIONS WITH PIETERMARITZBURG-MSUNDUZI MUNICIPALITY (Head of Department, Waste Management Division)**

1. Is schools's waste in Greater Edendale collected by waste management division? Yes No f no why not?
2. Are all greater Edendale schools' waste collected by municipality? Yes No If no why not?
3. Do you encounter problems when collecting waste at greater Edendale schools? Yes No If yes what are those problems?
4. Do you have any educational programme that can help school pupils to be able to handle waste properly?
5. Do you have any plans of using schools to inculcate the culture of own waste management? Yes No If yes what are those plans?
6. Are you involved in any composting projects in Pietermaritzburg-Msunduzi TLC? If yes what are those projects and where are they located?
7. Are there any composting projects that you are involved with in greater Edendale?
8. Can you suggest any ways that can be used to involve schools in waste management?
9. How do you view collection of other schools' waste by private contractors?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION

APPENDIX 8

INTERVIEW QUESTIONS WITH KPCA

1. Which recycling agents are doing collection in Pietermaritzburg?
2. Are these agents doing collections from schools in Greater Edendale?
3. Do you have any waste management programmes that involves schools in Greater Edendale?
4. Do you have any educational programme that can help school pupils to be able to handle waste properly?
5. Are there any rewards/incentives that you give to schools in order to encourage them to keep their schools and residential areas clean?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION

APPENDIX 9**TELEPHONIC INTERVIEW QUESTIONS WITH SELECTED RECYCLING COMPANIES**

1. Does your company collect recyclable materials from schools?
2. Are the schools in Greater Edendale, Pietermaritzburg in your schedule for the schools where you collect recyclable materials?
3. Do you encounter any problems when collecting recyclable materials from school
4. What problems do you encounter?
5. How are the schools cooperation with regards to the collection of recyclable materials from their premises?
6. Are there any rewards/incentives that you give to schools for collecting recyclable materials from their premises and what are they?
7. Would the company support a move to approach the Department of Education and Culture to ask for using the schools as “mini depot” for collection of recyclable materials by recycling industries?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION

APPENDIX 10

A GUIDE ON HOW TO BUILD A COMPOST HEAP

It is recommended that a good size for the compost heap should be 2 metres by 2 metres.

The following steps should be generally followed:

- Organic material should be mixed well and any big pieces should be chopped up. It is not advisable to add layers of only one material, such as grass cuttings or leaves to the compost heap.
- The first layer of a heap should consist of mixed organic material about 20 centimetres thick.
- To speed up the process of decomposition, a “starter” should be added. This might be a bucketful of manure compost, animal manure, or bone meal.
- The heap must be continuously built in layers of about 20 centimetres. The last layer should be soil, dry grass, leaves, or sawdust, as this will keep smells in and not attract flies. Another option is to make a compost bin which breathes from the base.

APPENDIX 11

MANAGING A COMPOST HEAP










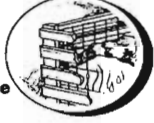







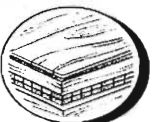



Inside the heap there is heat that is generated by the decomposition process. It must be ensured that this heat is maintained. If it has cooled down, this means that it should be turned and allowed to heat up again, because this heat speed up decomposition process and kills weeds and fly larvae. Turning also encourages decomposition and speeds up the formation of compost. It is imperative that the heap is kept moist, but not waterlogged as this inhibits decomposition and will make the compost smell. Absorbent such as sawdust, straw, or manure should be added if the heap is too wet.


It must be ensured that flies, rats and mice are discouraged from the heap. Flies can be controlled by immediately covering new material with dry soil, sawdust, grass or leaves. The heap should also be turned frequently so that enough heat is generated to destroy fly eggs and pupae. If there are any large white worms in the compost, they must be destroyed as they are the larvae of the large black and yellow fruit beetle that does much damage in the garden. Rats and mice can be controlled by not adding food scraps to the compost as this will attract them. Poisons such as insecticides to control pests should not be used as they will stop the decomposition process by killing the organisms responsible for decomposition, such as fungi, earthworms, and bacteria.

APPENDIX 12

COMMON COMPOST SYMPTOMS, PROBLEMS AND SOLUTIONS

Common Compost Problems

SYMPTOM	PROBLEM	SOLUTION
<p>Bad odour (rotten egg smell)</p> 	<p>Not enough air; pile too wet</p> 	<p>Turn it; add coarse material (straw or leaves)</p> 
<p>Bad odour (smells like ammonia)</p> 	<p>Too much green material</p> 	<p>Add carbon-rich material (leaves, sawdust, straw)</p> 
<p>Dry throughout</p> 	<p>Not enough water: too much woody material</p> 	<p>Turn it and moisten materials; add fresh wastes; cover pile</p> 
<p>Damp and warm in the middle but nowhere else</p> 	<p>Pile is too small</p> 	<p>Collect more material and mix the old ingredients into a new pile</p> 
<p>Damp and sweet-smelling, but will not heat up</p> 	<p>Lack of nitrogen</p> 	<p>Mix in a nitrogen source like fresh grass clippings, fresh manure, or bloodmeal</p> 
<p>Post infestation - dogs, rodents, insects</p> 	<p>Improper food scraps added</p> 	<p>Don't add meat, fats, bones or other animal wastes; use a rodent-resistant compost bin</p> 
<p>Flies</p> 	<p>Food scraps not covered</p> 	<p>Place fruit and vegetable wastes in the centre of the pile, cover with soil or other carbon-rich material</p> 



Greater Vancouver Regional District
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Sens To A More Livable Region

APPENDIX 13

A GUIDE TO WORM COMPOSTING

According to the GVRD “Worm composting is a natural method for recycling food waste. It can be done year round, indoors and outdoors, by apartment dwellers and householders”.

To start worm composting the following materials are needed:

- A container which is made of wood or plastic;
- Bedding consists of shredded newspaper;
- Food waste such as fruit and vegetable waste.

When the above materials have been collected one needs to fill the container with damp bedding. Worms should be added, and some of the bedding should be pulled aside to bury the food waste and cover it up with the bedding. One will find that over a period of two to three months the worms and microorganisms eat the organic material and bedding producing rich compost.

Red worms are best for composting as they thrive on organic materials, such as food scraps. Shredded newspaper and cardboard, shredded leaves, chopped-up straw and other dead plants, seaweed, sawdust, dried grass clippings, peat moss, compost and aged manure are suitable bedding materials. The GVRD suggests that “Two handfuls of sand and soil must be added to provide the necessary grit for worms’ digestion of food”.

- **When to harvest worm composting**

It is suggested that after two and a half months have past there should be little or no original bedding visible in the bin and the contents will be brown and earthy-looking worm castings. It is then time to remove some of the finished compost.

- **Common problems associated with worm composting**

Sometimes unpleasant odours may waft from the bin, which is a symptom showing that the bin

is overloaded with food waste. The solution is to gently stir up the entire contents to allow more air in. Stop adding food waste until the worms and microorganisms have broken down what food is in the bin. The drainage holes must be checked to ensure that they are not blocked. More holes should be drilled if needed. In order to avoid bedding that is too acidic due to a lot of citrus peels and other acidic foods a little lime should be added and acidic waste should be reduced.

Sometimes the bin may attract fruit flies. This can be prevented by always burying the food wastes and not overloading the bin. The GVRD suggests that a plastic sheet, piece of old carpet or sacking must be kept on the surface of the compost in the bin. The GVRD also suggests that, if flies persist, the bin should be moved “to a location where flies will not be bothersome”.